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First Complete Account of the 1933-35 Expedition, Which Added New Areas to the Map and Cast New Light on Scientific Problems

The second Byrd Expedition to Antarctica has completed its task and, in the following article Admiral Byrd sums up the results of the expedition—the explorations at sea, the flights into Marie Byrd Land, which uncovered new territory and determined that Antarctica is one continent; the geological and geographical discoveries of the trail parties, and the contributions made by the scientific staff.

By RICHARD E. BYRD,
Rear Admiral U. S. N., Retired.

ENDLESSLY this question is asked about polar exploration: "What is the use of it?" In a certain sense science supplies the answer. Geographical discovery, the brightest weapon in an explorer's armory, is only an elementary tool for getting at something deeper. Exploration nowadays reaches dignity only when penetrating past the superficial concerns of latitude and longitude. It brings the modern apparatus of science to bear upon the unknown for a truer understanding of the known and half known. In the twenty-two-point program of this expedition, geographical discovery was only a single point.

Among the subjects studied by this expedition during its field operations are astronomy, meteorology, physical oceanography, biology, oceanography, vertebrate and invertebrate zoology, mammalogy, physiology, glaciology, stratigraphy, petrography, paleontology, tectonic and economic geology, geophysics, physical geography, cartography, physical and terrestrial magnetism, bacteriology and botany.

The expedition has had the distinction of carrying cosmic ray research into the highest Southern latitudes thus far attained in the adventuresome pursuit of this most fascinating of newly discovered phenomena; of initiating the first meteor-observation program in Antarctica, with spectacular results; of introducing up-to-date technique in polar meteorology; and of gathering the first authentic data as to the thickness of the South Polar ice cap, thanks to the seismic sounding apparatus, the preliminary hints of which may radically change our conceptions of Antarctica.

The most casual survey of these subjects shows they are not esoteric and peculiar to remote places. Many of them are of every-day significance in civilization.

In certain respects my first expedition was a preparation for the second. Great problems still remained, and it seemed logical to try to close with them while we still had the advantage of an awakened public interest, the momentum of one successful effort, and while we still had available the nucleus of a well-trained personnel.

The intrusion of the depression made the task of building a second expedition formidable, but not insuperable. It was done finally, one way and another, and when we squared away for our job on Oct. 22, 1933, we numbered six score men, mostly volunteers, aboard two ships, the iron Jacob Ruppert, resurrected from the government graveyard, and the 60-year-old barkentine Bear of Oakland. We had aboard four airplanes, a fleet of six tractors, 150 dogs and the best tools of our trade that we could beg, borrow or buy.

Strange Bulge of White.

For many years my curiosity had been attracted by that strange bulge of white, unexplored space jutting into the Pacific Ocean in the Pacific Quadrant between the 170th and 120th meridians West. Somewhere behind it lay the most extensive stretch of undiscovered coastline on the face of the earth. Since the time of Cook, innumerable explorers had tried in vain to make a break through, only to find the way barred, as he had, by mountains of ice and a pack of impenetrable thickness. After leaving New Zealand, instead of laying a course direct for Little America, I resolved to try to cut away some of this unknown.

An unprotected iron ship like the Ruppert was a poor weapon with which to engage the worst pack ice in the polar seas, but we fortunately had another string to our bow. Cocked on a special tiered pedestal on the after deck was our twin-engined Condor biplane, William Horlick; in New Zealand it had been equipped with floats. It was our intention to press the vessel as far into the pack as seemed practicable, and when she was stopped to renew the assault by air. These tactics proved extremely successful, risky as they were.

The initial operations were auspicious. Laying a course to fetch us up at the intersection of the Antarctic Circle and the 150th meridian, we were gratified to break 136 miles past Cook's record, something in these latitudes which had not been surpassed in a century and a half. The ship ultimately attained Lat. 66.45 S., Long. 150.10 W. It would have been imprudent to risk driving her deeper into the ice; so we withdrew her for fourteen miles to a lovely open lake in the pack, and there let aviation carry the burden of the penetration.

Littered With Pack.

The first flight carried us within sight of the 70th parallel, close to 350 miles beyond the deepest penetration in this region and within 300 miles of the coast of Marie Byrd Land. To the limit of vision along our track the sea was littered with pack.

Enticed by the likelihood that no land lay nearer than the coastal front we had discovered in 1929, I decided then to run east to the 120th meridian, where Dr. Charcot had made a deep penetration, and try to gain the coast along that meridian. Those many miles of easting no man aboard the iron vessel is likely to forget; it was impressively instructive as to why this area has so long resisted invasion. We entered the heart of the greatest ice-producing region in the world, which we called the Devil's Graveyard. For days we never saw the sun.

The ship felt her way past innumerable bergs in dense fog. On a bright day Dr. Poulter, senior scientist, estimated we saw 8,000 bergs in twenty-four hours. On one day, in fog and in a gale, we lay helpless for an hour and a half in the midst of them with our engines stopped.

Flying in Fog.

Still we persevered, sometimes sailing into unexplored waters. At the 120th meridian the way south was barred by heavy pack; so we worked to the 116th meridian. The ice here was none too favorable, but time was getting short. On Dec. 31 we reached the pack for the second time, forcing the ship forty miles south to Lat. 70.05 S. From this point we withdrew five miles, to take advantage of open water for a take-off, and on Jan. 3, 1934, made our second flight, this time to Lat. 72.30 S., Long. 116.35 W.

Altogether it was a dramatic flight. Fog closed in, and on the return flight to the ship we had to fly blind part of the way. The air speed indicator froze and the plane was on the verge of icing up. Flying quite low, we twice burst over huge bergs with barely fifty feet of clearance. Haines, the meteorologist, said when we came aboard the ship, "Well, you fellows certainly stole one that time."

As before, the pack ran to the limit of vision.

Having already overstayed the time allotted for these eastern operations, and still facing the tremendous job of re-establishing the Winter base of Little America, we had no choice but to start the long voyage to the west. We withdrew from the pack and commenced to run along the front of it. Fortunately the wind and current had carried much of the pack out of our path, and, edging southward from the 67th to the 69th parallel, the ship again broke into unknown waters. On Jan. 10, when she stopped to let aviation resume the assault, she had reached Lat. 69.50, Long. 152.21. Here we had our third aerial thrust into the unknown, flying to Lat. 71.45 along the 152d meridian.

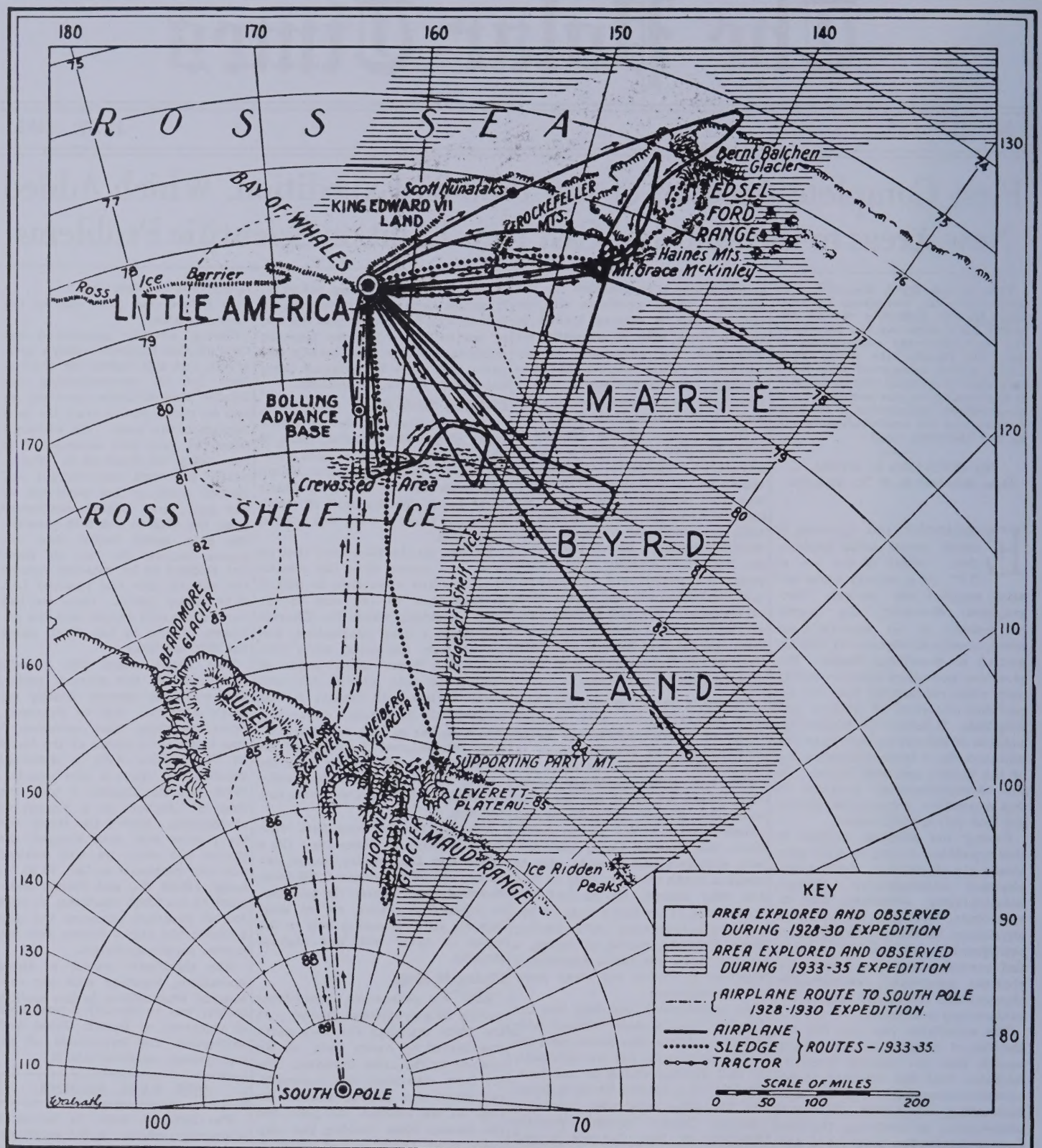
This flight closed the vessel's operations in the eastern sector. She was then steered directly for Little America. But in February, after the ships were unloaded, I was tempted to strike at the heart of the matter with a different weapon and from a new quarter. With Captain English I took the Bear of Oakland on a voyage of exploration. Before the worst sea ice I have ever seen stopped the plucky old ship, we had worked our way northeast to Lat. 73.05 S., Long. 149.30 W., and thence westward to the 159th meridian, so that for all practical purposes the gap between the flight tracks and the known coast was closed.

The significant result of these operations, together with our subsequent explorations in the eastern sector, was to identify a vast area of unknown as Pacific Ocean and extinguish the hypothesis of an archipelago reaching into it.

THE TASK BEGINS.

The bitterest task, in facing a wintering problem, is the establishment of the base camp. Luckily for us, the old buildings were available, though the roofs of several had been crushed by the snow; but new buildings had to be built for the larger personnel and a vast amount of stores had to be unloaded from the ships and transported to Little America. A direct approach was barred by impassable pressure ridges. A circuitous trail more than six miles long was cut through the ridges and at one point a ten-foot gap of open water was bridged with telephone poles.

Every ounce of stores—more than 500 tons in all—had to be hauled



BYRD'S RECORD OF EXPLORATION IN ANTARCTICA: A BLANK AREA OF THE MAP FILLED IN.

over that road. Night and day, for three weeks, tractors and dog teams shuttled between the caches. One plane made twenty-six flights to expedite the movement of vital equipment. The period was a white nightmare. Men worked until they dropped. The surging out-rushes of the bay ice menaced the ship, then the stores cached on the ice, and finally even Little America itself.

Still, in spite of these difficulties, on March 1 we were able to free Captain Innes Taylor and a southern party of six men and five dog teams for the vital mission of running a chain of food depots to Lat. 79.56 W. in preparation for the major journeys of the Spring and to dispatch Chief Pilot June and Demas southward with a fleet of four tractors carrying the equipment and stores necessary for the advanced meteorological base we proposed to establish somewhere on the Ross Ice Barrier and for its occupancy throughout the Winter night.

Meanwhile, under the direction of Lieutenant Commander Noville, executive officer of the expedition, a new city was built around old Little America, and, all things considered, it was really a first-class city. It could boast electric light and power, telephones, a well-equipped science laboratory, a first-class weather observation station, a radio station and a broadcasting plant, medical facilities, a machine shop, a tailoring establishment, a carpenter shop, a dairy housing three cows and a bull, and a transportation system geared to the varying gaits of dog teams, tractors and aircraft.

Little America was unique among the cities of the world in the diversification of talents enlisted among a company of forty-six men and in its fortifications against the contingencies latent in isolation. When

the recession of ice from the Bay of Whales made it seem possible that even Little America might break out, we built an emergency base called Retreat Camp on the high barrier about three-quarters of a mile to the south-southeast and stocked it with the bare essentials for survival.

Except for the crash and destruction of the Fokker airplane on a test flight and the dramatic appendectomy performed on Pelter, hard upon the alarums and excursions excited by a fire that threatened to destroy the surgical cache, the Fall operations closed uneventfully.

On to the Advance Base.

On March 22 I flew to the advance base to occupy the world's southernmost meteorological station, the occupation of which was important to our meteorological and auroral program. Till then most of the data on which our knowledge of the meteorology of Antarctica is founded were collected at stations on the coast or by ships exploring coastal waters. These stations naturally fell within the moderating influence of the ocean. No fixed station had ever been established in the interior, where conditions more truly characteristic of continental meteorology would be expected to prevail.

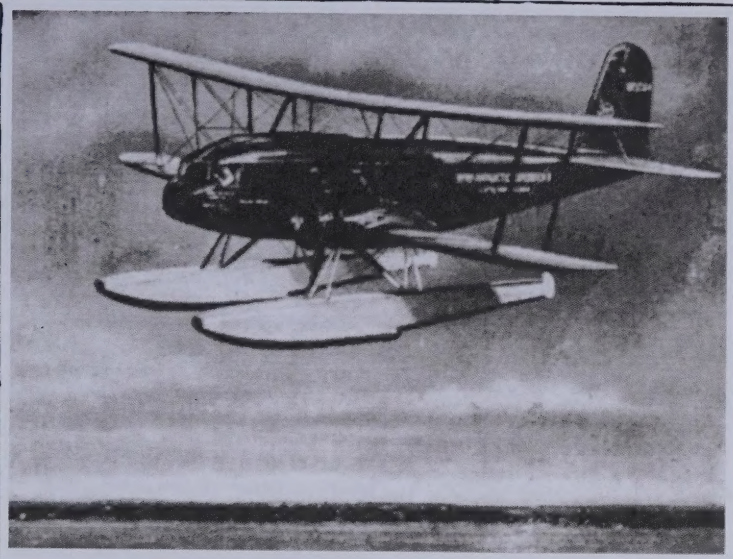
The advance base was a shack 123 miles by trail south of Little America. It was originally my hope to be able to advance the shack nearer the foot of the Queen Maud Range, 400 miles south but the delay in discharging the ships, caused by the unusual ice conditions, together with the difficulties in re-establishing Little America, made necessary a change in this plan. Nevertheless, we determined to advance the shack as far south as the tractors could make it before the onset of Winter jeopardized the crews.

[At the advance post Admiral Byrd spent four and one-half months in solitude, undergoing severe hardships. His experiences during this period of isolation are described in the article on this page by Dr. Poulter, who reached him with a relief party in August.]

Continuous Weather Record.

The advance base was equipped with up-to-date apparatus for maintaining a continuous record of wind, temperature and pressure from the day the base was occupied through the Winter night and until it was shut down, on Oct. 12. These elements, together with observations of auroral activity, were continuously recorded after my arrival at the base. Dr. Poulter made a valuable series of simultaneous meteor and auroral observations with observers at Little America.

On my return to Little America I found a smoothly running exploring machine ready to prosecute the missions we had outlined for it. Siple's party was about to leave for the first scientific penetration into Marie Byrd Land, with special interest in its geological and biological features. Blackburn's geological party was topping off preparations for a long thrust into the Queen Maud Range on a biological reconnoissance into the unexplored western margin of Marie Byrd Land.



Admiral Richard E. Byrd's Condor Flew Over 30,000 Miles in the Antarctic on Pontoons and Skis With Harold I. June as Pilot. It Had 2,000-Mile Range on Its Two Wright Cyclones.

Dr. Bramhall and Morgan were making the plateau party ready for a dash onto the polar plateau, the former with the object of gathering magnetic data in a region where such data are extremely inadequate, the latter to delve into the secrets hidden by glaciation with an apparatus never before tried in the polar regions—a seismic sounding device.

A Notable Thrust.

June, in Tractor 1, was already coming home after a splendid thrust to the southwestern angle of the Edsel Ford Range, having made the surprising discovery of a high plateau rising on the coast just east of the Rockefeller Mountains and flowing unbrokenly through King Edward VII, Scott and Marie Byrd Lands.

Demas was grooming two tractors assigned to support the geological and plateau parties, and Captain Innes Taylor, in charge of trail operations, was everywhere helpful. Pilot William Bowlin and the men of the aviation unit were working with perseverance to make the planes ready for the Spring flights.

The Marie Byrd Land party got under way Nov. 16, the geological parties left in company two days later, and the tractors, following in the wake of the latter units, cleared Little America on Nov. 25. We were free then to launch our aerial enterprises.

Antarctic problems more or less interrelated were immediately accessible to approach by aircraft. The first was the problem of the so-called transcontinental strait. For many years it had been supposed that an ice-clad sea-level trough divided the continent. This theory was postulated upon the identical indentations cut in the face of the continent by the Ross and Weddell Seas, and upon other persuasive evidence. Until the existence or non-existence of this strait was affirmed, no one studying Antarctica could say with certainty whether he had to deal with one continent or two.

A Mountain Mystery.

The second problem grew more or less out of our operations in 1929. On a flight to the northeast on Dec. 5 of that year we discovered east of the 150th meridian the new land which we named Marie Byrd Land. It is a rugged and mountainous land, heavily glaciated. Behind the western front range we saw innumerable peaks. On the journey in Tractor 1 June and his companions reached Mount Grace McKinley, the southwestern peak in the Edsel Ford Range. They confirmed the massing of peaks in the northeastern quadrant and found that the plateau rolled to the east.

The Marie Byrd Land problem opened up fascinating possibilities: How far eastward did these mountains trend? Did they form a tectonic link in the Andean fold chain which had been traced to Graham Land across the continent? Did this plateau fold southward to the Queen Maud Range, to merge with the high polar plateau, or did it die out somewhere, say on the northern margin of the transcontinental strait? These problems we hoped to solve by a series of flights calculated to strike at strategic points.

IN THE AIR

Seizing upon the first break in the weather, we launched the first flight on Nov. 15. The course we flew followed the structure of a scalene triangle. The base rested on Little America and the southwestern tip of Edsel Ford Range. The apex rested in the unknown at Lat. 81.05 S., Long. 146.30 W., approximately half-way between the coast of Marie Byrd Land and the Queen Maud Range.

The course recommended itself for these reasons: It would strike at the heart of the white space holding the fate of the supposed strait and search out half the front through which it might cut; it would determine the trend of the newly discovered plateau; it would indicate whether or not Marie Byrd Land were an archipelago or a distinct epicontinental mass separated from the mainland by ice straits or an integral reach of the continent; and, finally, it would bring the base line of this flight track in coincidence with the limit of vision of that of Dec. 5, 1929.

The flight crew comprised the chief pilot, the co-pilot, Bowlin, Navigator Rawson, Chief Radio Operator Bailey and myself. Leaving Little America we first ran down the southeastern leg of the triangle to the apex. Then we ran northward into the Edsel Ford Range at Long. 146.27 W., Lat. 77.30 S., which put us about twenty-two miles east and a trifle north of Mount Grace McKinley.

Then, rising some 11,000 feet above the Edsel Ford Range, we were struck by the massing of peaks to the northeast. It was as if a giant hand had strewn them there like so many pebbles. They streamed eastward and it seemed possible that these mountains skirted the continental front to form a link in the Andean chain.

A Low Depression.

Most fascinating of all, at the apex of our triangle, at a point where the belt of crevasses traversing the 81st parallel slithered off to form a curiously arrested white whirlpool at what appeared to be the foot of the plateau, we found a definite depression. We sounded the elevation with the plane's altimeter—a trick we later used to excellent advantage—and found it to be only 400 feet, nearly 4,000 feet below the highest known elevation of the plateau. From what we had seen there was strong reason to believe that if the transcoptinental strait did exist it must lie there.

That was only the beginning of the matter. Next day, the weather holding good, I dispatched June, Bowlin, Rawson, Aerial Mapping Cameraman Pelter and Bailey on a reconnoissance flight to assist the tractors which were dangerously bogged in crevasses at Lat. 81.05 S., Long. 157.30 W. Besides seeking a safe passage for the tractors, they were instructed to make a brief southing and find out, if they could, what lay south of the depression. Clouds and gales drove them back at Lat. 81.20° S., Long. 151 W., before they had an opportunity to make extensive explorations. The point at which they turned was approximately forty-three miles west and fifteen miles south of the apex of the triangle. The surface there seemed to be rising.

Because the weather is least favorable in that quarter, at the next fair spell we shifted our attack to the east in order to close our operations in that critical area before

the rise of the fogs and clouds of Summer. On Nov. 19 June, Bowlin, Rawson, Pelter and Cameraman Petersen were dispatched on a 390-nautical mile penetration into Marie Byrd Land. The purpose was to feel out within the range of the plane the trend of the new mountains we had raised behind the western front of the Edsel Ford Range, to map them with the camera in their proper relationships and, if possible, to find the coast. The course lay along the 78th parallel.

Clouds massing ahead forced the crew to turn at Lat. 77.55 S., Long. 133 W., but important results accrued. For the last 165 miles of the flight the mountains of Marie Byrd Land, so densely packed behind the western front range, were found to thin out, withdrawing into a range running to the east at the turning point. The crew had before them a massive, broken block which June thought might be an extinct volcano, a not improbable surmise in view of the fact that the Marie Byrd Land party later came upon the remnant of a volcano cone in the Edsel Ford Range.

The plateau, flat as the plains of Kansas, rolled its white gleaming roof in all directions to the horizon, and a sounding by altimeter, corrected later to true barometric pressure, put its elevation at 4,300 feet. The coast was nowhere in sight, but throughout the last stage of the flight the crew marked on their port hand a very decided water sky, and, in view of what we know it is quite likely that the coast of Marie Byrd Land will be found to follow the trend of the mountains which lie between the 76th and 77th parallels.

A Hint by Radio.

On Nov. 19 Blackburn's geological party, penetrating unknown areas 375 nautical miles south-southeast of Little America, flashed us an important hint by radio—the sighting of what appeared to be high land to the east of them. Weather held up flight operations for a while, but on the 22d. June, Smith, Rawson, Pelter and Bailey took off on the longest flight of all, a 960-nautical-mile journey which carried them ultimately to Lat. 83.05 S., Long. 119 W.

This flight resulted in important discoveries. As they turned they saw i the vicinity of Lat. 85 between the 110th and 115th meridians a cluster of ice-ridden peaks, presumably eastern prolongations of the Queen Maud Range, approximately 170 nautical miles east of the latitude of the last known peaks of that range. Commencing just a few miles southwest of the depression we had observed on the flight of the 15th they found a plateau rising and rolling unbrokenly to the feet of these new peaks.

Like every effort directed at the solution of unknown matters, the flight did not so much settle familiar problems as to raise new ones. Was this depression only a bight or bay in the Ross shelf ice on the western margin of the plateau? Would deepest penetration prove that these plateaus were one? At all events the fate of the transcontinental strait now lay in a sixty-mile gap between the 81st and 82d parallels east of the 147th meridian, and could be settled one way or the other.

A Problem Solved.

On Nov. 23 with June, Bowlin, Rawson and Petersen, I took off in the William Horlick to close the gap. Just a little bit south of the apex of the triangular course of the flight of Nov. 15, where we had found the depression, we headed east, sounding the elevation of the ice by altimeter as we went. When we turned at Long. 140 W., Lat. 81.10 S., we found that the surface under us had risen to 1,325 feet. On the return we sounded the northern border of the area and found that the elevation was uniformly 1,000 feet or higher.

The results were conclusive. The long-sought strait was non-existent. The plateau of Marie Byrd land rolled unbrokenly from the South Pacific Ocean to the Queen Maud Range. The eastern margin of the Ross shelf ice was at last defined by the coast of that plateau. The structural integrity of Antarctica was verified and a troublesome ghost of doubt was laid. Antarctica is one continent.

ON THE TRAIL.

Now the trail parties, pressing through cold, fog and blizzards to gain distant objectives, came into their own. Blackburn's party, made up of himself, Russell and Paine, with three dog teams, pushed up the untraveled slope of Thorne Glacier to run a geological cross section of this area of the Queen Maud Range. When they paused they had risen 100 miles up the blue ice of the glacier, and, with twenty miles still to go to the shining dome of the polar plateau, the peaks above them had diminished to mere nunataks. There, 180 miles from the South Pole, in the vestiges of a sedimentary strata, they came upon numerous beds of coal and plant fossils.

Geographically, their discoveries were equally impressive. The high plateau escarpment fronted by two high granitic ranges and numerous foothills west of Thorne Glacier dwindled East of it into numerous glacial ampitheatres enclosed by mountains of igneous rocks. The stream of ice debouching into Thorne Glacier from the east, which Dr. Gould of the first expedition had called Leverett Glacier, was found to be a sub-plateau.

Eastward the mountains dwindled in size, becoming increasingly engulfed by the ice pouring from the Polar Plateau which, at the head of Thorne Glacier, had dipped to an elevation of only 7,000 feet. The important point was that through the terraced structure of the sub-plateau of Leverett the plateau of Marie Byrd Land rose to merge with the Polar Plateau and that further east if the sinking of the Polar Plateau persisted the two plateaus undoubtedly met at a common level.

In a New Found Land.

Behind the coastal front of Marie Byrd Land, Siple's party, comprising himself, Wade, Corey and Stancliffe and three dog teams, traveled with excellent fortune. A sledging party, they had the unique experience of penetrating on a scientific mission into a land first discovered by aircraft five years before. Siple's biological finds were superb. The peaks of this new land, fully a hundred miles from the coast, bore a flourishing life. The pink and gray granites and the steel gray schist were painted with patches of green moss, white lichens and a spectacular red lichen.

Wade, the first geologist on the spot, found evidence which may verify what he had surmised after the flight of Nov. 15—that tectonically the mountains of Marie Byrd Land seem to form a massive link in the Andean fold chain between New Zealand and the Antarctic Archipelago, but that the petrographic dissimilarities make the connection less real than apparent. In a three-inch quartz vein slanting down the face of a mountain in the Donald Woodward group he found in situ a deposit of galena and elsewhere deposits of molybdenite and chalcopyrite from which lead, molybdenum and copper may be extracted.

The party brought back a rich harvest of geological and biological specimens. Siple gathered no less than two dozen different species of lichens and mosses, an excellent haul considering the fact that up to then scarcely a hundred different species had been found in the Antarctic, and most of these on sub-Antarctic islands. He also returned with samples of ice and water teeming with microscopic life.

The plateau party converted a misfortune into an accomplishment. The inability of the tractors to break past the crevasses along the eighty-first parallel in spite of gallant efforts forced Morgan and Dr. Bramhall, whose work was dependent upon instruments too heavy to be transported by dog teams, to throw their lot in with the tractors which were then directed on a long

Times Wide World.

The Machine in the Antarctic—A "Snowmobile" Used by Byrd.

curving course that ultimately carried them into Marie Byrd Land south of the Edsel Ford Range and back through Scott Land.

Seismic Soundings.

In this unexplored area Morgan made a valuable series of seismic soundings which will give us an inkling of the depth of the ice sheet and the character of the underlying land on the same track. Dr. Bramhall, using a dip circle and an askania balance, obtained a valuable record of the distribution of magnetic elements in these regions.

Although the results have only been partly analyzed, certain conclusions are already evident. Bramhall had reported that existing isogonic charts for the south polar regions, based as they are on very meager data, conform in general to the present state of the earth's magnetic field. His observations, however, indicate that a more or less uniform shifting of the lines as much as two or three degrees will be necessary.

December and January are always a critical period in the life of an expedition, for then the field parties are at the greatest distance from the home base and aviation must stand by night and day to seize the rarely occurring opportunities to break through the eternal mists and clouds of midsummer. Nevertheless we made three more attempts to break deeper into Marie Byrd Land. On Dec. 8 a flight crew was recalled sixty-five miles out when fog closed in tight over Little America; on the 15th a crew which had reached Lat. 75.10 S., Long. 14.30 W., on a flight to trace the coast of Marie Byrd Land, was turned back at the very edge of discovery by an ocean of clouds, and on New Year's Eve an attempt by Bowlin to penetrate to the Edsel Ford Range was blocked by the same conditions.

THE RESULTS.

Summing up, we can say that the results of the expedition are nearly all that we could rightfully hope for. Thanks to flight operations and the three sledging parties striking at strategic points along the front of Marie Byrd Land, we now have a better conception of the area which, in 1930, we lifted above the horizon. We know something of its geology and biology, of the thickness of the ice capping it, and by means of the mapping camera we shall be able to construct a map of its features.

This newest of American discoveries is a magnificent sweep of territory running from the Pacific Ocean to the South Pole, and encompassing more than 200,000 square miles of territory. Superb mountains lift gleaming peaks through the glacial seas covering it, and a grand plateau marches over all but the tallest peaks.

It must be clear to any one that such reviews as this can only outline the high spots and the general story. For the daily routine observations and efforts, each of which in its own field possesses great merit, there can only be passing mention. Prominent among these is meteorology. Haines, assisted by Grimminger, has extended the excellent observations on polar meteorology he began with the first expedition. In addition to routine surface observations he has made a continuous series of upper-air soundings with pilot balloons—a total of nearly a thousand over both expeditions.

Weather Studies.

Our particular interest in this direction is to study the circulation of air over the polar regions and to test the theory of the glacial anticyclone. It is a common mistake to think that polar weather is of concern only to the polar regions. The world's meteorolgy cannot be divided into airtight compartments. The poles exercise a great influence upon world weather, and a knowledge of the conditions prevailing in Antarctica has a vital bearing on long-range forecasting not only for the Southern Hemisphere but for the world.

In the same sort of category is the study of terrestrial magnetism, one of the strongest departments not only on this but on the first expedition. With better apparatus over a longer period of time Dr. Bramhall, assisted by Zuhn, has made a continuous registration of magnetic elements at the base station. Such data are of indispensable importance to a full knowledge of the permanent magnetic field of the earth.

The biologists, Siple, Dr. Perkins, Lindsey and Sterrett, have worked with the same quiet effectiveness. From the day we landed here they have studied life—the variety of birds, seals and penguins and the microscopic plankton that inhabit the ocean depths within their reach. Even in the dead of the Winter night Dr. Perkins and Sterrett could be found in the Bay of Whales, with the temperature 60 below, lowering a plankton net for specimens until every crack in the bay ice was closed.

Testing the Ice Sheet.

Now a number of these so-called routine observational activities, especially where they have been able to benefit by improved technique, will, I trust, provide several of the brightest chapters in the scientific report. Earlier in this article I mentioned several innovations this expedition has introduced. Of these the seismic soundings have yielded the most spectacular data.

This instrument, which measures the velocity and track of a sound wave beneath the surface, has at last provided us with long-sought means to tap the ice sheet, determine its thickness and get a hint of what lies buried beneath.

While Morgan was running his series of seismic soundings along the tractor track, Dr. Poulter made a series of soundings in the vicinity of Little America, the preliminary results of which threaten to force science to recast its present conception of the Ross Shelf ice as being largely water-borne.

He found that the ice is supported by an anchor on numerous submarine reefs and peaks. In many places where we had thought there was water these instruments showed land above sea level. Scarcely fifteen miles south of Little America a great hill rising in the barrier snow has been identified as an island, the summit of which is 1,000 feet above sea level and capped by 400 feet of ice.

Another excellent merit of the apparatus is that with its data we will be able for the first time to limit the probable volume of Antarctica ice to a reasonable figure.

A New Technique.

At first Poulter relied upon a dog team to carry his apparatus. Then he tried a tractor. Lately he has used the Condor plane William Horlick. Once he was flown to seven strategic points on a twenty-five-mile radius of Little America, at each of which he landed and made soundings. Returning to the main base, he developed his data that night.

It has been one of the firm negatives of my policies, never to land a plane away from base, if it could be avoided, on account of the possible disastrous consequences of a crack-up; but in this case I was tempted by the high promise of the research. Certainly here was exploration with a new twist—tracking down the unknown past a 600-foot armor of ice, with sound waves returning to whisper their discoveries to sensitive apparatus on the surface.

The cosmic-ray research is another innovation which has had highly creditable results. It was begun aboard the Ruppert by Dr. Poulter, Dr. Bramhall and Mr. Zuhn, carried across the Pacific, extended into new regions during the eastern cruise and made an integral part of the routine program at Little America. Recently, in order to determine whether or not the significant variations in cosmic-ray activity noted at high altitudes and lower latitudes occur at high altitude in high latitudes, we sent the apparatus to an altitude of 12,500 feet in one of the planes.

Cosmic-Ray Data.

The data, which have been only partly analyzed, have confirmed Dr. Compton's theory of cosmic rays as consisting in their major part of electrically charged particles of great penetrating power originating in remote space, which rain in a continuous bombardment through the earth's atmosphere. A variation of intensity of cosmic-ray radiation with geomagnetic latitude has been determined. Of equal and perhaps greater interest, the observations at Little America show an unexpectedly high absolute value and a slow increase in intensity which may presage some period variation.

Polar meteorology was likewise given a boost upward. In September, with the temperature still between 50 and 60 degrees below zero, Haines initiated a series of high-altitude aerological soundings, the first of the kind ever undertaken in the South Polar regions. The autogyro was equipped with a barograph for making a continuous registration of temperature, barometric pressure and humidity at different altitudes. Through September until the gyro crashed, McCormick made such flights on every clear day. Now that the major flights are safely past and a stand-by plane is not required for emergency purposes we have been able to resume these flights. The data, Haines believes, are of great value in understanding the general circulation of the air in these latitudes.

Considering how recent is the use of aircraft in polar explorations, we were able to put our planes to excellent use in many directions. Certain flights served as many as four purposes simultaneously: discovery, mapping, aerological soundings and altimeter soundings of surface elevations. On different occasions aviation was effectively employed to reconnoitre dangerous terrain for field parties.

Hazards Present.

The hazards, to be sure, remained. The keenest sort of cooperation was required between the meteorologist and pilots. Practically all our later flights were barely squeezed in between periods of unfavorable weather; but the main program was successfully executed.

Radio, too, as a polar tool made important advances. Every field party was equipped with radio and reported at fixed intervals. As many as five parties have reported to the main base on a single day. When important flights were pending these field parties filed weather reports from their widely scattered positions. The planes were in continuous communication with the main base and have on occasion communicated with field parties in the area of their flight, passing on important information about crevasses and other hazards in their path.

With such communication facilities, the credit for which belongs to Chief Radio Operator Bailey, Engineers Dyer and Hutchison and Operator Waite, I possessed directive influence over scattered units that no other leader of a polar expedition ever possessed. Any important discovery, any crisis, any situation requiring quick action, extraneous assistance or further investigation could be at once communicated to Little America.

Polar Bears Hide Black Marks.

Polar bears are wise enough to know how black their noses are, Dr. Richard L. Sutton Jr., Kansas City wild game hunter, told the Oklahoma State Medical Association about it recently. "When a bear is stalking a seal it moves cautiously to where the seal is sunning itself," he said, according to The Associated Press. "When the destined victim opens an eye, as it does every few seconds, the bear covers its nose, the only black part about it, with a paw and stands still. Its white fur is almost as dazzling as the snow."

BYRD'S COURAGE TESTED BY HIS SOLITARY VIGIL

The second Byrd Expedition maintained on the Ross Ice Shelf the furthest south weather station ever established. Here Admiral Byrd lived alone through the long Winter night. The story of his vigil, which tested his strength and courage, is told in the following article.

By THOMAS C. POULTER, Chief Scientist and Second in Command, Byrd Expedition.

OUR arrival at Commander Byrd's advance-base weather station at the southernmost and coldest spot ever inhabited by man marked the end of a horrible ordeal endured by a man alone, cut off from human aid by a code that he refused to break.

Though for two months three of us lived there with our commander, jammed together in his nine-by-thirteen room, we learned next to nothing from him of his experience, for he told us no more than bare courtesy required. I had expected this, for I knew that the many thousands who heard him lecture on his last expedition were struck by the fact that not once did he mention himself. Therefore, when he writes of this expedition, he will, I am sure, as is his custom, omit the part he played. That his experience may not be entirely lost, I have consented to write this article

When we first saw him, on Aug. 10, we were shocked at his appearance. Emaciated, hollow-cheeked, weak and haggard though he was, he met us casually, calmer by far than any of us. "Hello, fellows," he said, as if he had seen us only yesterday, but his ghastly condition and husky voice told us that, in spite of this matter-of-factness, he had been through some terrific things. When I learned that his condition had been even worse and that his most desperate time had been many weeks before our arrival, in the very middle of the Winter night, I realized dimly what his battle for survival must have been.

Since that time I have been collecting here and there the pieces that go to make a consecutive story of his trials. Some I have gathered from casual remarks he has dropped from time to time in conversation or in the discussion of his cold-weather problems. Some I have from his old friend Murphy, who received and handled his radioed instructions, and still more from his record, a part of which I had a chance to read. Putting the pieces together I discovered that I have come upon something rare. It is a picture of a mighty trial of manhood and spirit and reveals something of Byrd the man.

Peaceful Solitude.

It appears that for the first weeks of his isolation the commander enjoyed himself immensely. In fact, he found an indescribable tranquility in his solitude. He welcomed the hardships and strenuous physical labor imposed by his environment, an environment strange almost beyond conception. He was cut off for a period from life and the sun and most of the familiar things of civilization as completely as if he had been on the dead silent and eternally dark side of the moon. Could any man alone keep his mental balance under such conditions? That danger was one of the gravest he faced.

The commander, however, did not view it with alarm afterward. Having met the hazard with equanimity he expressed his opinion that any average man could do the same. With this I disagree. When he had successfully passed nearly half of the Winter nights the clouds of disaster loomed suddenly. He was stricken down by poisoning from the combined fumes of his improvised oil stove and the gasoline engine powering his radio generator.

Oil had to be used instead of coal because the lateness of the season prevented more than one trip to the advance base and coal was too heavy to carry. This had necessitated the improvising of an oil burner from an ordinary caboose-type coal stove. When the disaster occurred Byrd had been living in his little room three and a half months and had from the beginning been breathing in and gradually absorbing the poisonous fumes of his faulty stove.

On May 31, at the end of a radio schedule, he went into the snow tunnel to shut off the engine and was knocked dizzy by the fumes of the exhaust. Later he found that the vent had been clogged with ice. He was quite ill that night. The next day about supper time he found himself in a critical condition. Apparently the incident of the previous day had lowered his resistance to a point where his system had finally succumbed to the effects of the fumes from the heater buried under the snow.

Wrote Out Instructions.

Ill, alone, helpless in the middle of the Winter night with three months of darkness and killing cold facing him, survival seemed impossible, so in the dim light of a candle, with fingers numb from cold, he lay in his bunk and calmly wrote out instructions for his leaders.

Instructions ended with the statement, "Don't worry, carry on normally and go as far as you can in carrying out the scientific program, but put the lives of my men first. Do what you can for Ellsworth." These notes written on loose white sheets he tied on a string and hung from a nail in the wall over his bunk, and there they were when we arrived months later, but yellowed as time yellows paper. Two days after he was stricken down he got in touch with Little America by radio, but said nothing of his condition. For weeks he was on the thin edge. For relief all he had to do was to tap out on the radio three letters, S O S, and every man at Little America would have volunteered to rush to his aid with three tractors along a known trail. He would have been reached probably without casualty, possibly at the cost of some man's life or limb.

Kept Radio Going.

Indeed, he went much further than his refusal to call for help, and in so doing lessened his chances for survival. Time and again he exhausted the slender reserve of strength he had struggled so desperately to gain in order to keep radio contact. After his engine broke down, he had to hand-crank the generator. He knew that, in spite of his instructions to the contrary, his men at Little America would have fought through to him had radio communication with him suddenly ceased. He does not talk of this but the facts show his reasoning. Indeed he even tapped out jokes on his telegraph key to throw Murphy off the track.

His most dangerous enemies were cold and fumes. He could avoid the cold only at the price of absorbing poison fumes. The incredible odds demanded all the concentration of his trained mind. He was so weak that he had to creep and was unable at times to eat. He apparently faced inevitable defeat, but not for a moment could he, nor did he, cease fighting.

In order to lessen the fumes he had to endure an unbelievable amount of cold. He had his stove out fourteen hours out of the twenty-four. The temperature was once eighty degrees below zero and often ran twenty degrees colder than that at Little America. He suffered much pain in various parts of his body where the poison settled, especially in the head and eyes. His stomach was affected so that he had to force himself to eat. For weeks he could not read and to such a degree he had to husband his strength that at times he dared not risk cranking the phonograph. Pain made sleep difficult.

Throughout all this his devotion to his purpose was shown by the completeness of his auroral and weather observations. Aside from the visual observations necessary, there were four recording clock-driven mechanisms constructed for bitter cold weather operations. These had to be kept in running condition. He measured these instruments and kept his record with the meticulous care of a trained observer.

The records are valuable to the science of meteorology and well worth while from the practical standpoint because meteorological observations in Antarctica are leading the way to more reliable world weather forecasting. That knowledge of Antarctic weather is essential to successful long-range forecasting not only for the Southern Hemisphere but for the world in general.

Solitude Necessary.

Little America is on the seacoast, hence Byrd's inland weather station was necessary and important. It had to be a one-man station for psychological reasons; for two men to live together under such conditions was out of the question. Temperamental harmony would have been an impossibility and even if the persons had been congenial and adaptable there was no use in subjecting more than one to the hazard of being cut off from a doctor.

Again the station was established too late in the season to stock it with supplies sufficient for three men; so Byrd himself undertook the lonely vigil. This was in line with his rule not to order any one to do what he himself will not do. I have attempted to visualize the period when he could not read, lying there suffering in his bunk in the inky blackness of his buried room. The bitter cold must have bitten bone-deep. He does not tell us how he endured the monotony the silence, and the utter loneliness. He did, however, let drop on one occasion that for weeks he faced the possibility that the next day he would lack the strength to get his food and fuel out of the snow tunnels.

Reply to a Request.

But these facts came afterward; we did not know them at Little America. I did not know them when I requested his permission to make a tractor journey to the advance base with the benefit of improving twilight of late July for meteor observations. His disarming reply to this request said: "I approve the trip only on condition that you can make it without undue risk to the men on the first attempt."

We turned back half-way short of the advance base in obedience to his strictly worded safety precautions. When we did reach the advance base in August we were scarcely two weeks ahead of the sun. His need for aid had passed. He had fought it out alone and wholly within himself in June and, in spite of recurring periods of weakness, he was once more struggling uphill.

I don't know of anything finer than that in life or literature. The odds were so overwhelmingly against him that he should rightfully have lost his fight. Had he done so his chivalrous regard for us would have been only too evident. It is natural that he should have our deep gratitude for what he endured and for his willingness to face the supreme sacrifice in his thoughtfulness for our safety.

A new book by Rear Admiral Richard E. Byrd is on the Putnam Fall list. Its title is "Discovery."

Fortune and Misfortune in Antarctica

Adventures and discoveries of the 1934–35 Ellsworth Expedition to Graham Land

IN NATURAL HISTORY

By LINCOLN ELLSWORTH

Trustee of the American Museum

THERE are so many interesting facts about the great unknown continent of Antarctica that few people realize their significance and volume by merely looking at a map of this great polar region. To start with, Antarctica is quite a sizable place. In fact, it is 5,000,000 square miles in area — or as large as Europe and Australia put together.

In contrast to the North Pole, which is an ocean surrounded by continents, Antarctica is a continent completely surrounded by water. One of the interesting features of the Antarctic is that the South Polar Plateau lies 10,000 feet above sea level while the North Polar region lies 10,000 feet below sea level. By that I mean that the ocean at the North Pole is from 10,000 to 12,000 feet deep. I speak from personal observation, for in 1925, when Amundsen and I were forced down 120 miles from the Pole, we took two soundings and found depths of 12,000 feet.

Asia has been called the "Roof of the World," yet Antarctica is on the average twice as high as Asia and seven times as high as Europe. This vast continent, locked in the grip of everlasting winter and covered with an ice cap which is estimated to be more than a mile and a half in thickness, is 90 per cent unexplored.

The 1933 Expedition

The base of my first Antarctic expedition was the Bay of Whales in the Ross Sea. I planned to fly the 1450 miles from there to the Weddell Sea, because I wanted to learn, if possible, if these two great seas meet and thus divide Antarctica into two parts. Another problem that interested me was whether the highlands of Graham Land, which are considered to be a continuation of the Andes of South America, continue on across Antarctica to join the mountains of Victoria Land. It is possible that the Queen Maud Range is a part of these mountains.

We sailed south from New Zealand December 10, 1933, aboard the "Wyatt Earp," but were held up by the great pack ice leading to the Ross Sea until near the middle of January. That made it too late for a season's exploration journey such as I had planned. So this year I decided to reverse my program and fly from the Weddell to the Ross Sea, selecting Deception Island as my base. This remote and uninhabited island lies just 600 miles south of Cape Horn and is separated from South America by the stormiest ocean in the world.

Deception Island, 1934

After an uneventful voyage of 5000 miles across the lonely, storm-swept South Pacific from New Zealand, where the ship had wintered after her return from the Ross Sea, we arrived at our new base in Deception Harbor on October 14, 1934. We had been looking forward to finding decent spring weather there, but instead, winter conditions with gales and snow squalls still prevailed.

Deception Island is bare and desolate except for the buildings of an abandoned Norwegian whaling station that has not been used since 1930. It is a known fact that about 100,000 whales have been killed in Antarctic waters during the past twenty-five years, and there are thousands of whale bones in this harbor, with the result that the stench at low tide is terrible. Besides being the graveyard of whales it is also the graveyard of whalers. A tall monument was erected on the island in memory of the crew of an entire ship that was crushed in the Weddell sea pack and went down with all hands aboard.

It was a week before we could get the "Wyat Earp" through the ice-cluttered harbor and up to the dock to unload the plane. The "Wyatt Earp" is a fine little exploring ship. I named her after the great frontier marshal of Tombstone and Dodge City. He was the most efficient peace officer and the greatest gun-fighter the West ever knew. It is an odd coincidence that I named my ship after him before I learned that Wyatt Earp held his first frontier job in Ellsworth, Kansas.

We spent a week unloading the plane and another week assembling it. Again luck was against us, for no sooner had the motor been started than a connecting rod between the piston and the crankshaft broke. An extra connecting rod was not to be found, for it proved to be the sole item not included among the extra parts we took with us.

Merely because a little strip of steel was forgotten, our boat had to make a voyage of 1800 miles to South America and back in order to replace this part. The "Wyatt Earp" made the round trip in sixteen days, due to the exceptionally favorable weather, which completed 28,000 miles of voyaging for her since leaving Norway, July 29, 1933. All these miles in quest of a twenty-hour flight!

While the boat was gone, we assembled the emergency supplies to be carried on the flight in case of a forced landing. A hand sledge was loaded with emergency rations sufficient to last two men two months. The load weighed just 500 pounds.

Among the delicacies we dined upon during our stay on Deception Island were penguins and their eggs. There are thousands of penguins on the island, in fact, it is one great rookery. Penguins are funny, fearless, and friendly fellows. They stand with their eggs between their feet and hatch them that way because they do not build any nests.

On learning that the penguins would put up a fight if we tried to take their eggs away without giving them something in return, we really developed quite a technique at egg-snatching. We would go up to a penguin and, while gathering the egg with one hand, would shove a hat under the bird with the other; then quickly pull the hat away again. A penguin egg is about the size of a duck egg and is good eating when fried or made into an omelette. But steer clear of a boiled penguin egg!! It has the consistency of rubber and tastes like strong fish.

Our delays at Deception Island were costly. Day by day the snow melted, and with miserable weather prevailing — anything but flying weather — we abandoned all hope of a take-off. So, with the assembled

A CONFERENCE ON ANOTHER FLIGHT ACROSS ANTARCTICA: LINCOLN ELLSWORTH, Who Will Return to the South Polar Regions to Make a New Aerial Survey, Explains His Plans to Roy Chapman Andrews (Right), Director of the American Museum of Natural History.

plane loaded on deck, we lifted anchor on November 28 and headed south for regions more favorable, or so we thought.

We traveled 150 miles south along the west coast of Graham Land and tried to reach Port Lockroy but could not get there because of the ice pack. We set a northward course, passed through Antarctic Sound, and as the ocean in that neighborhood this year — early in the season — was remarkably free from ice, we were able to go into the Weddell Sea and go as far south as Snow Hill Island.

Snow Hill Island is one of the most interesting spots in Antarctica — a small dot in that vast region of ice and snow — made famous by the expedition of the great Swedish explorer, Nordenskjöld. One of our most dramatic moments on Snow Hill Island was finding Nordenskjöld's hut thirty-three years after he wintered there in 1902 and 1903.

Nordenskjöld's ship, returning to pick him up after his first winter there, was crushed in the ice. This meant that he and his party of five had to spend a second winter in the Antarctic. We could reconstruct the helter-skelter scene as the men made a mad rush to reach the rescue ship, an Argentinean gunboat, that reached them just in time to effect their rescue before the ice shut them in for the third winter.

Three dogs lay just where they had been shot thirty-three years ago. Their bodies were mummified and still covered with white hair. Hats lay where they were dropped — a pair of boot-trees were there, and the most amusing thing was a pair of ice skates. Unopened sardine cans and packages of chocolate also lay about. We didn't bother with the sardines, but the chocolate was still good. We also found an old-fashioned phonograph and a dozen wax records — but even in Antarctica the tunes were terrible.

The hut itself was a bare little dwelling, gyved on the four corners with steel cables. This was done to keep the hut from being blown away. A sound precaution, for in his book, Nordenskjöld speaks of ninety-mile gales that roared for weeks at a time.

When we looked through one of the small windows into the hut, we were amazed to see nothing at first but a huge block of blue ice that almost filled the interior. How that ice came to be there we never could discover. A large timepiece hung on the wall and the hands pointed to three o'clock. We took it down, set it going, and it ticks away now, just as it did thirty-three years ago.

The Nordenskjöld Fossils

The purpose of Nordenskjöld's expedition was to search for fossils on Snow Hill Island and plenty were discovered. We, too, found quite a few fossils and they tell a strange story, — that Antarctica once had a subtropical climate. The waters were warm, the land was green, and both land and water teemed with life. Mighty trees covered the land — but that was 75,000,000 years ago.

In all, we brought back about 200 fossils. They included about 50 species of shell fish and several pieces of petrified wood. These specimens were turned over to the American Museum of Natural History to be studied by Dr. Chester A. Reeds, curator of invertebrate palæontology.

The thing that astounded me most in finding these fossils was that they were of creatures which showed signs of having been fat and well-nourished. Naturally I asked myself the question, "What sudden catastrophe could have overtaken this land, rich in animal and plant life?" So far, I have not found the answer.

Of course, our hunt for fossils did not start until after we moored the "Wyatt Earp" to the front of the glacier which runs to the very edge of the island, unloaded the plane, taxied it up to the plateau above, a mile and a half inland and 600 feet above sea level. There we found the snow firm and suitable for our take-off.

Next, all hands manned the sleds and hauled two tons of gasoline and oil up the steep slopes. It was a hot and back-breaking job, for although the Antarctic summer at sea level hangs about ten degrees below the freezing point, the sun's reflection on the snow throws off quite a little heat.

We put up a tent close to the plane in which four of us planned to live in order to carry on with the flight if it became a question of the boat having to leave on account of menacing ice conditions. We made a few test flights and were all set to take off but could not leave because the weather became almost unbearable. To add to our troubles, the ice front commenced to break off and the "Wyatt Earp" was forced to move out to safe anchorage.

For ten days a gale ranging from twenty-five to fifty miles an hour blew, accompanied by snow, so that all we could do was to stay aboard and gaze longingly southward upon the ice-studded expanse of the Weddell Sea for just one break to get into the air. Our very existence became a game of "patience" — our only weapon against the unpredictable and uncontrollable forces of nature and the elements.

The only visitor we had in the Weddell Sea was an emperor penguin. This bird is one of the most remarkable animals living. Among other things, it lays its single egg in the dead of winter so that the young will be large enough to take care of itself the following winter. Both fathers and mothers fight to take care of the young, and the poor infants are so mauled with love that they frequently seek shelter in the crevasses of the surrounding rock to escape destruction. The mortality rate must be very high, because young penguins are often found frozen to death in these refuges — victims of parental love.

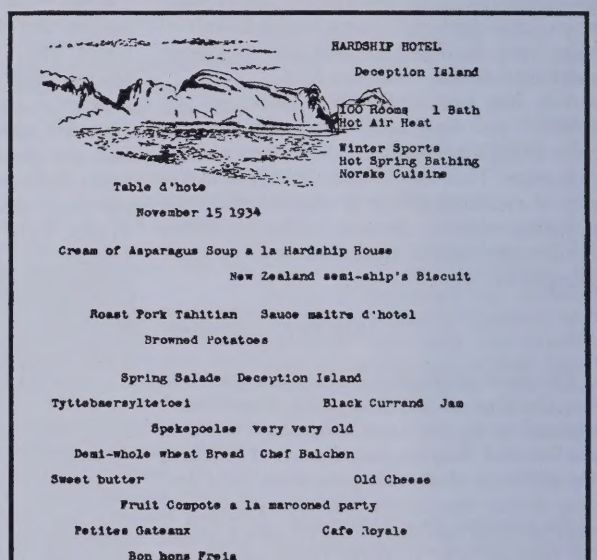
Misfortune

Finally, on January 3, 1935 — after five weeks of weary waiting — our chance came. But we lost it because it took us a long time to get the "Polar Star" with its total load of 6698 pounds into the air. The new snow, which had fallen on January 1, had drifted into low *sastrugi* in patches on the glazed surface of Snow Hill Island Barrier, and they acted as would a series of morasses on a regular landing field. Each one slowed up the speed of the plane with a marked tendency to turn the machine over on its nose. Time and time again, Balchen brought the airplane into the wind which was blowing down the slope of the best take-off area, but we could not get off on the up-grade.

Once Balchen turned his head and yelled: "Look out! I think we will turn over." I made sure my safety belt was tight and braced myself, but — nothing happened.

Discoveries

After almost an hour of taxiing, Balchen turned to a dangerous downhill slope on the southern side of the island and in a side wind opened up the 525 H.P. Wasp motor. With our movable pitch propeller set at the most advantageous angle, we finally got clear of the sticky surface. A little earlier in the afternoon the prospects had seemed excellent, but when we reached an altitude of 3000 feet, we saw a snow squall to the south. It blocked our path as effectively as if it had been a stone wall. The only thing to do was to go as far as possible and to do as much new work as opportunity would allow. Hence, after circling the "Wyatt Earp," we crossed Snow Hill Island, Lockyer Island, and flew over the glacier-fringed southern end of Ross Island to Cape Longing. Then we skirted Sobral Island, passed over Lindenberg Island, and between Robertson Island and Seal Nunataks. Here the clouds closed in above us and light conditions were extremely bad. In a few minutes we could see more squalls descending and we turned southwestward to follow the edge of the storm.



A BANQUET AT THE ANTARCTIC

A decorative menu evolved by the commissary department of the Expedition

Without going into protracted details about the flight, let me say that it added five islands, three deep fjords, and several conspicuous mountain peaks to the sum of human knowledge about the Antarctic.

The ice-encrusted Antarctic seems vast and vague to those who have not seen it. But until you fly a mile above its surface, thereby extending actual vision of conditions across a diameter of several hundred miles, it is impossible to comprehend the vastness, the might, and the seeming unconquerableness by puny man of this ice-bound world over which we soared on man-made wings.

After our flight, which lasted two hours and a half, we stayed on the island as long as we dared, hoping for another chance. But it never came. In a few days, the ice began to come in — huge icebergs that drifted toward us in ghostly silence and soon covered the surface of the sea.

On the 10th of January we knew that our time was up if we were to get back home, and on the 13th, we pulled the anchor up and tried to get out. Our attempt was unsuccessful. After journeying sixty miles, we were turned back to Snow Hill Island by heavy pack ice. The next day we tried again. The sea was covered with solid ice floes that measured many miles in each direction, but Providence was with us. That day we got as far as Vega Island, a matter of about 100 miles. At Vega Island the ice closed in on us again. We could not go ahead. We could not turn back. We were caught and we were almost done for. After talking the situation over, we agreed that the best thing to do was to prepare to abandon ship. We all worked furiously throughout the night, checking emergency rations and preparing packs with which to struggle over the ice or drift on a floe to open water where, with our life boats with us, we could take to the sea.

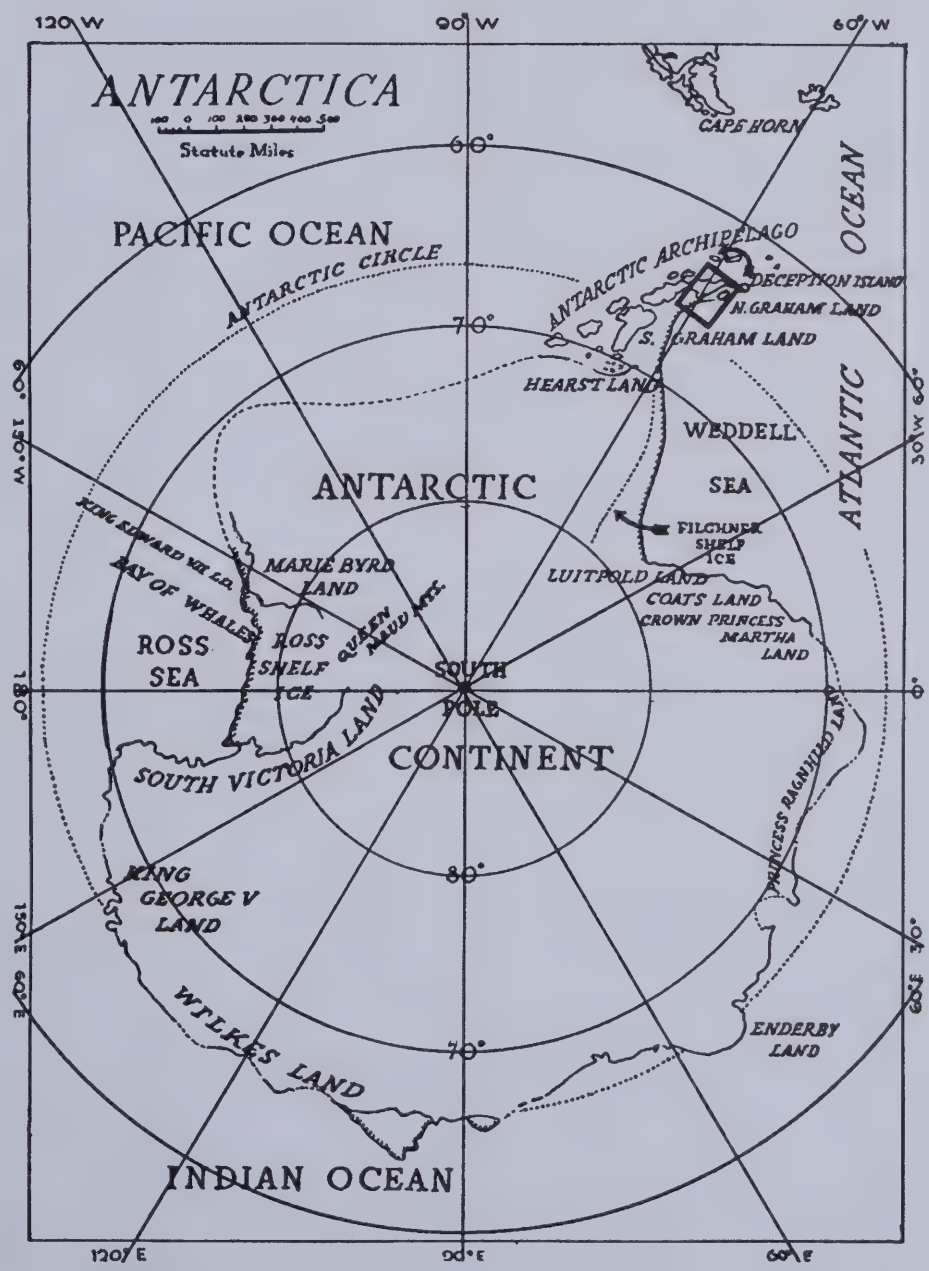
We were ready to abandon ship, but about four o'clock in the morning the wind changed. Instead of sweeping ice down upon us, it swept it away. That was a change in our favor. We knew that to go on was courting trouble, but realized it was a risk we had to take. Mile by mile we worked our way northward, and, at last, after a trip that seemed like centuries, but lasted only a day and a night, we got out of the treacherous Weddell Sea into the clear waters of the South Pacific.

Lure of the Unknown

In retrospect, our recent exploration stirs us with mingled feelings. I suppose it is only natural that our satisfaction over the safe accomplishment of a difficult thrust into the borders of the largest unknown area on the face of the globe should be tinged with the inquietude of curiosity not fully satisfied. It is this unresting curiosity that has always driven explorers toward the complete discovery of every land and every sea, and toward the full utilization of the resources which are man's heritage on this planet. There is satisfaction, to be sure, in having added the results of this expedition to the sum total of knowledge. And perhaps I should be content in having taken part in five polar expeditions. Yet the lure of the unknown still beckons.

Unloading the "Polar Star" on the shelf ice at Snow Hill Island

Dragging the supplies up the steep slope from the sea was a gruelling grind



THE ELLSWORTH 1934–35 EXPEDITION

The small square at the upper right represents the scene of Lincoln Ellsworth's exploratory work. The flight added five islands, three deep fjords, and several conspicuous mountain peaks to the sum of human knowledge about the Antarctic

Lone Man Conquers Arctic In 2,000-Mile Trek by Sled

Missouri Youth of 24 Is Nearly Mad With Pain After Six Months of Peril in Barren Lands of Canada—Ate Seals Raw.

By JACK O'BRIEN,

Surveyor for the Byrd Antarctic Expedition of 1928-29.

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BAKER LAKE, N. W. T., Feb. 27 (By Wireless).—Huddled miserably in a wretched snowhouse, sick, weak and half mad with pain, 24-year-old Dave Irwin of Sarcoxie, Mo., was found last week by native hunters from Baker Lake post.

He was rushed by fast dog team to the post, where he is receiving proper attention.

The tale of Irwin's trip, his suffering and hardships is one of the most dramatic stories to come out of the North in years. Authorities are amazed at the stamina and nerve of Irwin and consider his trip one of the greatest on record.

Two years ago the young adventurer signed up to accompany the huge reindeer herd that has been driven across North America into the Eastern Arctic to form the basis of food supplies for the Eskimos, who at times face starvation when game is scarce. The slow, monotonous movement of the big beasts proved tiresome to Irwin and he decided to cut loose and mush across alone, prospecting on the way.

With a well-equipped dog sledge and good dogs he began his hazardous 2,000-mile journey. Down from Aklavik, which borders the Polar Sea, he swung, driving along across the treacherous barren islands, at times wading knee-deep in soft snow, again splashing through slush ice on the river courses or slogging into the bitter winds and biting blizzards prevalent throughout the Arctic.

At times he met an odd trapper, or came across a small snowhouse village where he stopped for a short time with the Eskimos. But not for long, as his goal was King William Island on the other side of the continent.

Across Great Bear Lake, then straight on toward Coronation Gulf he went, traversing the most bitter and forsaken section of North America.

To travel this section of the North one must depend a great deal upon the land for food, for it is impossible to pack any great load. Last year, however, game was scarce, and as Irwin plunged further and further into the bleakness of the barrens the pangs of hunger tortured him day and night. His dogs began to stagger. The dogs were being used as pack animals, and Irwin realized that his number was up if he did not get food soon.

He came to a little tidewater stream and for hours he waded along shallow pools, carefully herding fish close to the shore, where he had placed rocks in a corral-shaped trap. As the tide went out some fish were at times left in these pools. It was slow, disheartening work, and the dogs, howling their distress, made it more difficult by splashing into the pools usually at a time when Irwin's labors were about to be rewarded. After hours of patient work he would have one or two fish. He would divide them among the dogs and slowly munch some of the raw flesh himself.

Finally, last July, he arrived near the magnetic pole on Boothia Peninsula. He rested there and then began the trek south to civilization. He was driving the same dogs plus a puppy that had been born on the trail and that he had nursed on the sledge.

Lashes Himself in Traces.

It was on this leg of the trip that real trouble beset every move. Dog feed became scarce again, and Irwin searched for days for seal. At last, half starved, he came upon a trading schooner locked fast in the ice, but the grub was all gone. Hunger was making him desperate, and he lay for hours near the open water, weakly kicking his feet in the air, the native method of attracting the seal. They believe such a moving, fur-clad figure is one of their own and come near. Irwin was lucky enough to kill some, and tore raw meat out by handfuls while his ravenous dogs attacked the carcasses.

On he went, floundering through open leads, clothes dripping, wet at times, only to be quickly frozen solid. The dogs' feet dripped blood from the sharp ice and Irwin lashed himself to the sledge and pulled. Snowblindness burned his eyes shut. Tears streamed down his face and froze into a mask.

At his side Irwin swung a useless hand, swollen to double its size through blood poisoning from the Summer mosquitoes. The thumb of that hand is now withered and shrunk, and Irwin will be lucky if amputation is not needed.

One by one the dogs weakened, three freezing to death while trying to get rest in the cold. Irwin chopped his sledge in two, to lighten the burden of the remaining dogs, and pushed on.

Ice Breaks Beneath Him.

Then he went through the ice near Cockburn Bay, just above the Arctic Circle. He was crossing a treacherous stream. The ice suddenly roared away from beneath him and he was just able to cut the dogs loose and drag them and himself, dripping wet, to the shore. His knee was badly dislocated by the fall, his poisoned hand completely useless, and he was without fire, clothes, food or firearms.

He would walk until he staggered to the snow in a heap from exhaustion, lie there until the frost drove deep into him, then flounder up and limp ahead a few hundred feet until the great weariness again bore him down. Raw dog food kept life in his body.

At last he plunged through the weird darkness of the Arctic to an abandoned igloo and stood swaying in the half light staring at the frozen body of an aged Eskimo woman.

He killed a dog so he might live. Then he became very ill. The dog meat had been poisoned from the dog's own fatigue, and Irwin lay near death for two days. When he was at last able to stand he reeled out again into the snow, heading south as always.

Two days later he came to an Eskimo village and stumbled down before the door of a snow house. The kindly people were frightened at first. They were one of the most primitive tribes, the Oukushiliks. Only one of the villagers, an old woman, had ever seen a white man before. That white man had been straight and strong and daring on the trail, and in 1903 had come to the camp where she lived. His name was Amundsen.

Nursed by the Natives.

Irwin was taken in and nursed, and he and the Eskimos lived six months on raw, frozen fish. It was here that the Back River Eskimos who hunt for the dog food used at Baker Lake post found him. He was rushed to the post.

Irwin is a big fellow, well over six feet, yet he was just an ice and dirt-crusted bundle when they took him from the sledge. His clothes were ribbons, his hair below his shoulders, his beard many inches long. His eyes were glazed with fever and the horror of his experience. Apparently he had almost forgotten how to talk. At first he spoke to the post people in a combination of Eskimo and English.

Careful introduction to food brought back Irwin's strength. Today he spends most of his time eating and sleeping. It will be days before he is able to be around. Then—and here is real nerve—he plans to outfit and go south under his own power another 800 miles by dogs to the rail head at Churchill.

Two thousand miles alone—six months without seeing a living soul! Men of the North like this young American. He is the type of man that will not let this savage country beat him.

Irwin Wirelesses to Uncle a Report of Arctic Adventure.

SARCOXIE, Mo. Feb. 27.—Dave Irwin, in a few cryptic words wirelessed to an uncle here, told of his dramatic fight to beat his way to civilization in a single-handed trek

Times Wide World Photo.

Dave Irwin, with Coma and Goona, arriving in New York

of 2,000 miles through the Arctic.

The message, to Gilbert H. Wild, Sarcoxie peony raiser, revealed that young Irwin probably had taken moving picture records of his journey.

"Sorry worried you," the message read. "Left King William Land July. Then went through rotten ice. Never saw human six months. Few fish trapped in shallow water. Made goal, haven where ammunition. Wintered. Pack on bank closed in with ice. No fire. No grub. Found harbor schooner Schumagen frozen. Three hundred miles west nearest white man. Traveled inland, found an Eskimo trade—near Spring. Around Christmas. Lived with them since.

"Traveled alone over 2,000 miles. Was in the vicinity of Magnetic Pole. No instruments to find——. Three days sled travel from trading schooner. There are better times ahead. Re-outfit Spring, heading South. Excellent moving pictures primitive Eskimos. Life tough. Straight frozen fish, no fire, no houses. Dark. Learned to appreciate tea, bread and sun. Wire Pa how things are. Send nothing. Money is unknown. Dave."

Young Irwin is the son of Mr. and Mrs. W. T. Irwin who left Sarcoxie for Grand Rapids, Mich., about six years ago. Mr. Irwin is a traveling salesman there. The youth has made several trips in Arctic regions.

Dave Irwin was known in Sarcoxie as an extremely adventurous youth. He cared little for books. His friends here could not recall whether he had attended local schools. They did know, however, that the husky, six-foot boy would seldom stay at home. He liked to roam.

David Irwin, the Sarcoxie, Mo., youth who went to the Far North in search of adventure and found it, arrived in New York May 13 for a visit before returning to his home. He stepped off a train at Grand Central Station with two of the four dogs that pulled his sled on a 2,000-mile trek alone from Alaska to Hudson Bay.

The youth seemed surprised that any notice had been taken of his adventures. He said he had made the trip for the "sport" of a difficult feat and had turned down several offers of aid during his travels because he insisted upon completing his journey alone.

REINDEER HERDER TELLS ARCTIC SAGA

Big Drove Beset by Wolves and Lured by Caribou on 5-Year Drive in Canada.

Andrew Bahr, Laplander, who is called "the best reindeer man in the world" and who was sent to Alaska in 1898 to teach reindeer husbandry to the Eskimos, describes here his experiences in the unprecedented drive of reindeer from Western Alaska to the Mackenzie River delta in northwestern Canada. The drive, with Bahr in charge, began in 1929. The reindeer were bought by the Canadian Government for the Canadian Eskimos. Bahr told his story to Max Miller, author of "I Cover the Waterfront" and other books.

By ANDREW BAHR,
As Told to Max Miller.

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EDMONTON, Alberta, March 26.—My boys and I may have been frostbitten and bruised, out on our feet and groggy, snow-blinded at times and starved, but the reindeer herd at last has just been delivered and that's the main thing, mister.

It's a long way from the west coast of Alaska to Canada, you know, and it's three times longer when you're trying to keep 3,000 reindeer together, and I would say that, for every deer in the herd, we traveled a mile, counting the many times the deer were stampeded by wolves and we had to back-track.

The time I mighty near had to give up was the time I mighty near died. It seemed all over, it did. I was in the middle of a flat ice country, a hundred miles across, that had no markings. The blizzard had hid the moon and it was as dark as if there were no moon, and my Eskimo boys and I had separated to find some of the deer if we could, but we couldn't, and we had been up on our feet for sixty hours straight with the temperature 50 or 60 below and blowing right through us.

I had hired an Eskimo guide of the locality, but he was lost too, he was, but he wouldn't say so.

"How much further?" I asked him.

"Three hours," he said.

We were trying to find an island which had some provisions on it, and, after we tramped in the dark four more hours, I asked him again: "How much further?"

"Three hours," he said.

Three Hours Stretch to a Day.

I'm not a youngster no more, you know. I'm past sixty, and when my face and wrists began to lose all feeling, and when my legs stopped moving through the snow the way they should, I said to myself: 'Well, Andrew Bahr, it's all over, isn't it?"

I yelled through the wind to the guide: "How much further?"

"Three hours," he said. This was all he knew and that three hours was stretched into twenty-five before finally we stumbled onto the place, meaning twenty-five hours added to the previous sixty when driving herd.

On the Christmas of 1929, when we started the drive to Canada from Elephant Point, Kotzebue Sound—that's way on the other edge of Alaska, you know—the experts figured we either would get the 3,000 reindeer to Canada in two years or would not get them there at all. Well, she's been a good five years and some, mister. And of the original herd which started out, I can't say how many finished. Fawns were born each Spring, and those which lived had more fawns, so I would say much of the 2,370 deer we delivered were not those we started out with.

A lot went to the wolves. A lot ran off with the wild caribou, and once, in a blizzard, a lot of head got stranded on a big piece of ice which broke off and carried them out into the Arctic Sea to be drowned, and there was a sad sight to see, let me tell you, but all of us were fighting for our own lives at the moment, so the best we could do was watch them go.

Avoided Caribou Country.

Whenever we could we avoided wild caribou country, for, in their way, these caribou can deplete a herd quicker than wolves can. There was no telling when a herd of wild caribou might come out of nowhere at full speed smack into our own herd. Get mixed up and take reindeer off at a gallop with them. My Eskimo herders would then have to go out and try to get them back again, which meant a matter of many days.

But in one of the worst Winters of all even the caribou for some reason cleared out. It was too tough a Winter even for them at this spot and that time. The wolves had been living off the caribou somewhat, and now, with the caribou gone, the wolves closed in on our deer and what a mess that was. They took from 150 to 200 animals that Winter, I'd say. But it was the way they scared the deer which was the worst.

The wolves usually would wait until a blizzard was on before making an attack. They were not in large bands, but ran in bunches of from four to twelve mostly, and, when the snow was so thick we couldn't see anything, it was just then that they would close in. The herd would take fright and scatter, so that we would have to spend the next two or three days trying to round them up. Sometimes they would run thirty or forty miles and, when we did find them, they would be so exhausted we could not travel with them next day.

Once, in trying to round up a big herd that had broken away, we were gone so long that our food ran out and we lived for six days on one cup of flour and the hard dough broken from the sour-dough pot. This was chipped from the pot and we each took nibbles.

But up close to the Arctic Coast, when we began to think that everything which could happen to us had already happened to us, my two Eskimos asked to have their wives join them from Kotzebue Sound. The men's clothes were all in shreds by then and so were their muk-luks (Eskimo boots), and they needed the women along to make new outfits. We got the request through somehow by way of some trappers in Northwest Canada and the families were brought around in a little trading boat through the Arctic Ocean.

After the wives had been with us a long time a baby was born. It died later and is now buried beneath the snow up there.

Tom Wood, one of the Eskimos, was lost for three days and was sure he was going to die. The temperature was 70 degrees below. When he could go no further he fell down into the snow and began to pray. That's what he did. And a long distance off he thought he saw a person in the storm. Tom's nose, chin, cheeks and wrists were frozen, and he could not talk. But he stumbled on toward the person, and there it was, a woman, and a white woman. She was standing in front of an igloo. She turned out to be a trapper's wife, who had just gone outside for a minute to study the storm, and that's why Tom feels so sure that God answered him.

He feels so sure about it that when we finally reached the Mackenzie River long afterward, and a Canadian visitor asked Tom what he would like given to him from the outside, the only thing Tom asked for was four hymn books and two Bibles.

The request was forwarded on down to Edmonton and took a long time getting there, but the ministers did not know what kind of a Bible Tom could read, so they finally decided to make sure by sending him one printed in English, one in Laplandish and a third in Eskimo English.

These two Eskimos, Peter and Tom Wood, were with me more than three of the five years. When the herd reached the west bank of the Mackenzie and help began to reach me from the other side, I thought the boys had had enough, so let them go home, one of the wives being seriously sick. A trading boat took them to Point Barrow.

24-Hour Shifts in Herding.

These boys admitted afterward that never in their lives had they gone through anything like that before, and no wonder. On regular days the shifts at herding would be twenty-four hours long, and more often than not twice as long as that. To keep the deer together, they would have to ski fast around the herd and the perspiration would freeze their clothes, making the clothes as hard as planks.

Two of my Eskimo crews were forced to quit because of the tough going. And once in the camp, when I was so sick I thought sure I would pass out before morning, I worried about what would happen to the herd, so told the boys to keep on with the herd to Canada, no matter what happened.

"These deer are for your own people who are starving over there," I told the boys. "The deer will save them the same as it saved your own brothers in Alaska." The

MAP OF A DARING TREK THROUGH THE ARCTIC.

Route of Dave Irwin Jr., 24 years old, of Sarcoxie, Mo., who, alone, traveled 2,000 miles across Canada, conquering the Arctic Barrens in six months of hardship and danger.

boys knew that I spoke the truth, so promised to try to continue on no matter what happened to me before morning.

The final crossing of the Mackenzie delta this time was not as tough as when we had tried to cross it that time before, but it was tough enough, for, if a wind should have come up and cleared off the snow from the ice, the deer would all have been stranded out there, slipping all over themselves and breaking their legs and necks. It's about 100 miles across, you know.

But Dan Crowley, the American who came from the east side of the river to help me, staked out a route ahead of time across the ice so we could see where we were, and on to some of the frozen islands out there we packed in sacks of moss ahead of time for the deer to eat in case we were caught in the middle. As it was we had to hurry the deer so fast that some of them dropped in their tracks and had to be carted the rest of the way on our sleds.

It was dark all the time, you see, except for the moon which shone all through what would be your daytime here. And a month or so before when we were about all set for the final dash, imagine how we felt when an unexpected blow not only cleared the ice of snow but the moon also right up and had a total eclipse on us. That's what it did.

GREELY, 91, HAILED FOR ARCTIC EXPLOIT

Medal of Honor, Granted at Last by Congress, Is Given to Explorer of '80s.

WASHINGTON, March 27.—Amid military pomp, on his ninety-first birthday, belated recognition was given today to Major Gen. Adolphus W. Greely, retired, the Arctic explorer, with the presentation to him at his home in Georgetown of the Medal of Honor recently voted by Congress. The presentation was made by Secretary Dern.

When General Greely returned from his heroic adventure a half century ago, he found that he had been dropped several files in the promotion list. He was then a first lieutenant, although he had emerged from the Civil War as a brevet major of volunteers after a distinguished record in many battles.

He is only the third army officer to receive the Medal of Honor by special act of Congress. Awards usually are made under a general statute restricting them to a period within three years of an act of gallantry above and beyond the call of duty.

The other exceptions are Colonel Charles A. Lindbergh and Colonel John O. Skinner, a veteran of Indian wars.

Survivor at Ceremony.

The only other surviving member of the Greely Arctic expedition, Brig. Gen. David L. Brainard, retired, was present at the ceremony today, which was the fifty-first anniversary of the time when Greely, observing his birthday, believed his expedition lost beyond hope after it had penetrated to Latitude 83:24 North.

Three months later a handful of starving men, the only seven remaining of the expedition, were rescued near Cape Sabine by Captain W. S. Schley.

There were full military honors today. A troop of the Third Cavalry, with color guard and the regimental bands, were stationed outside the little house.

Upon Secretary Dern's arrival there were four ruffles of drums and four flourishes of trumpets. Inside the small living room, the color guard and color bearers stood just behind General Greely.

Mr. Dern was flanked by two aides, Colonel David L. Beckham and Lieut. Col. John T. Kennedy, the latter a Medal of Honor man. To the rear of them stood invited guests.

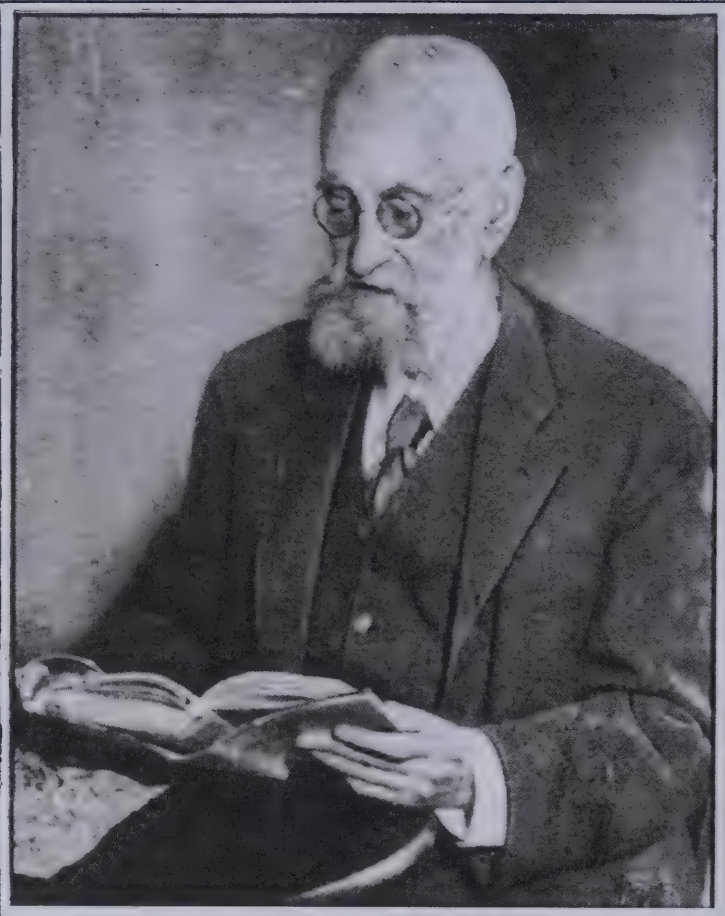
After the band had played the national anthem, Colonel Beckham read the official citation and Mr. Dern made the presentation. As the ceremony ended the band played marching airs.

Citation Is Read.

The citation read:

"Adolphus W. Greely, Major General, United States Army, retired. For his life of splendid public service, begun on March 27, 1844, having enlisted as a private in the United States Army on July 26, 1861, and by successive promotions was commissioned as major general Feb. 10, 1906, and retired by operation of law on his sixty-fourth birthday."

Members of General Greely's family present were his three daughters, the Misses Rose and Antoinette Greely, who live with him, and Mrs. Harold Shedd of North Conway, N. H., and a son, Adolphus W. Greely Jr



MAJ. GEN. ADOLPHUS W. GREELY,
Leader of the ill-fated Arctic expedition of 1881-1884, who received, by special act of Congress, a Medal of Honor.

WASHINGTON, March 18 (AP).—A few hours after the House had voted him a Congressional Medal of Honor, Major Gen. Adolphus W. Greely, Arctic explorer, said tonight he thought that "maybe the country is changing its mind" about him.

"I was up there, out of the world for three years," he added, "and when I got back I found I had been demoted, through political pull."

At 91 the thought still rankled, but the general, sitting at ease on a sofa in his old Georgetown home, stroke his gray beard and recalled later recognition which carried him to one of the army's highest ranks.

"In '98, the President took me before the Cabinet," he said, "and I was put in complete charge of all the telegraphic and electrical work throughout the Spanish War."

In 1881, at the head of a government expedition, Greely discovered land north of Greenland and pressed on to a point farther north than had been reached by any explorer previously.

"I've been in the army seventy-four years now," he declared. "I started out with Justice Holmes, when I was 17 and the Civil War broke out. We were both in the same brigade and both wounded three times."

In retirement, General Greely, alert despite his years, keeps in close touch with political and economic developments and follows the accomplishments of present-day Arctic and Antarctic explorers.

WILKINS PLANNING BASE UNDER THE ICE

To Use Submarine in Arctic for Lengthy Study of Ocean Currents and Weather.

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WINNIPEG, Man., May 8.—Sir Hubert Wilkins, bearded traveler in the cold places of the earth, has revealed further details of his plan for establishment of a submarine meteorological station beneath the Arctic ice, 400 miles from the North Pole.

The next sortie of the Australian explorer will be a submarine journey across the top of the world. If success crowns that venture, the submarine will be sent back to a prearranged spot, there to lie for months, possibly years, while its crew of scientists and engineers chart ocean currents and collect meteorological information.

It is all part of a great plan that eventually will enable the weather men of the world to forecast far in advance the general weather conditions in any part of the globe. Meteorological stations would be established in the Arctic and Antarctic regions, and readings from these, coordinated with data from stations in the temperate belt, would enable the charting of the weather's vagaries.

Sir Hubert hopes to start with his submarine next year. Under the ice, it will chart the currents. When weather readings are to be taken, it will drill its way through the ice to the surface.

Sir Hubert turned to the submarine after three years' work with airplanes in the Arctic, seeking land bases for meteorological stations. Suitable ones could not be found on the surface. A submarine can reach points inaccessible to any surface ship, he pointed out. They can be made comfortable and spacious, and the underwater temperatures are 80 to 90 degrees warmer than on surface.

Experiments made by Sir Hubert with the submarine Nautilus in Arctic waters in 1931 demonstrated the ease and safety of operation under the ice. His new craft will be able to carry food and supplies for three or four years.

OSLO, June 28.—Sir Hubert and Lady Wilkins arrived here from Sweden tonight.

Concerning plans for a northern polar basin exploration, Sir Hubert stated a new submarine would be built for the purpose. The cost of such an expedition is calculated at $200,000, of which he has raised $125,000. Test voyages have been made in the old Nautilus and in 1937 it is expected to make a voyage under the whole polar sea.

"My hope," he declared, "is that the expedition may be carried out in two months, with sixteen hours of undersea voyages daily. When my work with the Ellsworth expedition is finished I shall return to the United States by way of England in order to confer with British shipyards on the construction of a new Nautilus. Whether the submarine will be built in England or America has not been decided."

The Polar Times

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THE POLAR TIMES highly recommends "The Polar Record," published January and July by the Scott Polar Research Institute, Cambridge, England.

Burrelle's Press Clipping Bureau of New York furnishes polar clippings to THE POLAR TIMES.

The American Polar Society was founded Nov. 29, 1934, to band together all persons interested in polar exploration. Membership dues are one dollar a year, which entitles members to receive THE POLAR TIMES twice a year.

SOVIET SHIPS TO PLY THE ARCTIC PASSAGE

Four Scheduled to Traverse the Northeastern Route This Summer.

By HAROLD DENNY.

MOSCOW, April 14.—The Northeast Passage through the Arctic Ocean from Murmansk, in extreme Northeastern Russia, to Vladivostok—which men have tried for four centuries to conquer and which has swallowed up hundreds of intrepid explorers—is scheduled to be opened to regular freight traffic this Summer.

This was learned here today in connection with the fifteenth anniversary of the founding of the All-Union Arctic Institute and the first anniversary of the epic airplane rescue of the Chelyuskin expedition off a Siberian icefloe. The announcement of the freight service was made by Professor Otto Y. Schmidt, leader of the Chelyuskin expedition and now the head of the Northern Sea Route Administration.

Four freighters, two from Murmansk and two from Vladivostok, will make the entire voyage this Summer, said Professor Schmidt. The route has been divided into four sections, in each of which will be stationed an icebreaker. Each icebreaker will precede a freighter through its section and then turn the ship over to the icebreaker of the next section.

Wide Arctic Traffic Scheduled.

These voyages, fulfilling the dream of a short route to the Far East that once fired Henry VIII of England, will be only a part of extensive traffic in the Arctic Ocean this Summer, Professor Schmidt revealed.

The commercial and industrial development of the Far North has already compelled the Council of Labor and Defense to prepare a sea freight plan for the Arctic, in which seventy-three large ships as against forty-six last year will be employed in addition to those carrying coal from Spitsbergen. They will ply in various regions along the whole extent of the Soviet northern coast.

This Summer also an interesting voyage of exploration will be begun by the icebreaker Sedoff, carrying two airplanes and scientific instruments from Greenland to Tixie Bay, skirting the northern shores of Severnaya Zemlya and other little-known islands. The object is to test the theory of Professor N. N. Zuboff that ice-free waters caused by the Gulf Stream lie north of the eighty-second and eighty-third parallels.

Only two ships have penetrated beyond those parallels—the late Dr. Fridtjof Nansen's Fram and Brusiloff's St. Anna. Many prominent polar scientists and veterans of the Chelyuskin expedition will be in the party.

The current celebration is emphasizing the rapidity with which the Soviet Union is making a productive region of what not long ago was largely a frozen waste. Innumerable expeditions have been discovering coal, nickel, zinc, tin, copper, gold and oil at various points within the Arctic Circle. Methods of agriculture and strains of plants capable of growing in the Far North are being developed in the hope that the North can be made largely self-sustaining.

Air Lines Extensive.

Aviation lines cover the Arctic and link up explorers' camps in isolated spots. Last year Soviet Arctic fliers covered 318,000 miles, carrying 547 passengers and 40 tons of mail and cargo. A network of Arctic airlines, covering 17,000 miles, has been ordered completed by 1937.

Murmansk, which nine years ago had fewer than 9,000 inhabitants, now is a crowded metropolis of 80,000, with a waterworks, power station, theatre, several hotels and a large canning plant for treating immense quantities of herring now brought in from the Barents Sea.

New honors were heaped today on Professor Schmidt and his Chelyuskin comrades, and the Order of Lenin was awarded to Professor Rodolphe L. Samoilovitch, director of the All-Union Arctic Institute, who has studied the Arctic for the past twenty-five years. He discovered the coal deposits in Spitsbergen in 1912. He was in charge of the rescue of the crew of the Italian dirigible Italia in 1928 and he participated in the Graf Zeppelin's flight over the Arctic.

Andreievland Is a Myth, Declare Soviet Explorers

By The Associated Press.

PROVIDENCE BAY, Siberia, Oct. 4.—Mythical Andreievland does not exist.

The icebreaker Krassin, after traveling more than 2,000 miles in Chukotsk and Eastern Siberian Seas and sending its airplanes on scouting tours aggregating 25,000 miles, has disproved the existence of the land which the Russian explorer Andreiev reported he discovered 172 years ago.

Director Smirnoff of the Krassin expedition announced here yesterday that there was absolutely no land whatever north of Wrangel Island, where the "Atlantis of the Arctic" was supposed to be.

HE 'HEARD' TIME FLY

EXPLORERS near the South Pole do not necessarily require clocks to trace the flight of time around the globe—radio does it for them, according to Walter J. Lanz, radio operator of Ellsworth Transantarctic Flight Expedition. He recently returned to New York after several months at Deception Island, on the edge of the Antarctic Continent.

Mr. Lanz revealed how with a "radio set, a ruler and chart of the globe" he was able to follow the hours in their flight around the world.

"We could spot the hour of sunset in New York;" said Mr. Lanz, "because waves in the region of 15 to 20 meters began to be unsteady and unreliable for communication. At the same time, the 36-meter wave, on which we communicated with THE NEW YORK TIMES daily at 7 P. M., Eastern standard time, began to be useful. We knew when it was dawn in New York for the same reason; the longer waves began to be unreliable and the shorter waves steady and clear.

"Knowing that a change from daylight to darkness, and vice versa, had the greatest effect on certain waves, it was fairly easy, with a little experience, to accurately estimate time.

"Hearing" Dawn's Arrival.

"Listening on a certain wavelength, we could 'hear' dawn or night arriving in Eastern Europe, then in Western European cities, a few hours later on the East Coast of the United States and Canada, then the Middle West, the Pacific Coast, Hawaii, Manila and the Far East," he said. "On one wave we could 'hear' waning day on another, waxing night.

"When the 24-meter channel was good for New York operation our clocks were most likely to be between 3 and 4 in the afternoon. When the 27-meter channel was best we found we could estimate time as near 5 o'clock, and be approximately correct. When the 36-meter wave to THE TIMES was best we knew it was dark in New York, and so on.

"With a chart and a ruler, this general time-wave idea was applied to other cities of the world. Along a line drawn between Deception Island and the Scandinavian countries, for instance, we knew good reception would prevail only when darkness covered a large part of the pathway of the waves. Hence it had to be after nightfall in Bergen, Norway, where the transmitter was located."

Stations in Europe and on the Pacific Coast of the United States were the most consistently heard, and the 13 to 15-meter telephone channels between New York and South American cities were "strong and remarkably clear of static for eight hours every day, during daylight," Mr. Lanz said.

"Despite the frequent static storms which seemed to centre around the islands we heard broadcast stations and short-wave relay transmitters throughout our four months in the Antarctic. Broadcasts from New York, the Pacific Coast, Europe, Africa and Central America contributed unknowingly to relieve our isolation.

"Weather bulletins came chiefly from Admiral Byrd's camp at Little America; that was the region of the globe in which we were most interested as a landing place for our plane, should it fly over the polar ice-cap. Unfortunately, fog, snow and storms prevented the flight.

Clearing Up a Tangle.

"It was amusing to receive reports by radio that 'Ellsworth Flies the Ice-Cap to Little America,' as carried by papers all over the country, when we were still snugly tucked in at the Shetlands with no opportunity to take off. Then we sent our dispatch to THE TIMES that cleared up the world-wide news tangle.

"It was difficult to receive from and transmit to Little America. Often three or four waves were tried before one would get through. The men of Little America, however, seemed never to tire of helping us get the weather reports."

W. J. A. GRANT DIES, 83; AN ARCTIC EXPLORER

LONDON, March 10.—W. J. A. Grant, old-time Arctic explorer, who gave a dance for 400 friends a year ago when told he had only a few days to live, died today in Collompton, Devonshire, at the age of 83. He was a member of nine Arctic expeditions, and for him Cape Grant in Franz Josef Land was named.

His first trip to the Arctic was made more than a half century ago aboard the Pandora relief ship of the Alert and Discovery expedition, which was led by Sir George Nares. For his services to science the Arctic Medal, struck at the time of Queen Victoria's proclamation as Empress of India, was awarded to him.

The Late W. J. A. Grant

CAPT. BERNIER DIES; ARCTIC EXPLORER

Made Several Vain Attempts to Find Northkest Passage—Placed Caches in North.

LEVIS, Que., Dec. 26 (AP).—Captain Joseph E. Bernier, noted French-Canadian Arctic explorer, died at his home here today after aan illness of several weeks. He was 83 years old.

Son of a Sea Captain.

Rear Admiral Byrd some years ago called Captain Bernier the "dean" of Arctic explorers. The captain was born at L'Islet, Que., on Jan. 1, 1852. He was of French-Canadian descent, the son of a sea captain, Thomas Bernier. During his career the explorer covered more than 500,000 miles in his travels and had been master of 107 vessels.

The captain was an apprentice before the mast ata an age when children of today are in grammar school. At 17 he received his first command; he was master of his own sailing vessel. The North Atlantic called him in his youth. Later he explained how he came to devote himself to the Arctic: "Once you get the Arctic fever, the lure of exploration and the adventurous life holds you in its grasp. You cannot escape it. The Arctic holds you."

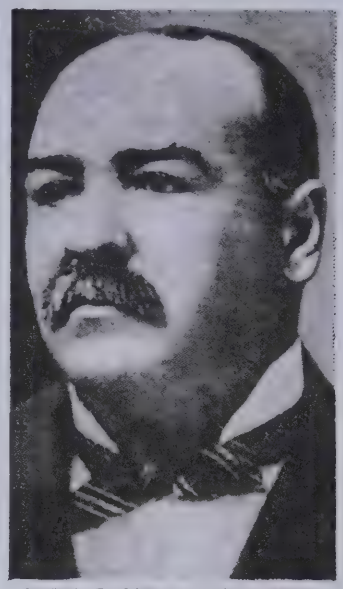
The date when he first went beyond the Arctic circle is not a matter of record, but one of his last voyages was as late as 1927. He then was 75 years old.

Captain Bernier's first recognition by the public and the Canadian Government came early in the present century, when interest began to be taken in the islands of the Arctic. He then became semi-official explorer for the Department of the Interior, and had equipment and vessels supplied him. For a quarter of a century he planted the British flag on uninhabited and practically undiscovered islands.

At an early age he held the belief that a commercial passage—at least during part of each year—existed in the Arctic regions. That was before Amundson went through the so-called Northwest Passage in a vessel. In 1910 Bernier planned to attempt the passage. He said at the time that, had it not been for iron-clad instructions of the Canadian Government to him, he could have gone through to the Pacific Ocean on his previous voyage to the Arctic in 1908-09. It was his belief that a passage existed North of that made by Amundson and that fro mnear the North Pole a vessel might proceed to the Pacific Ocean. He never succeeded.

His Work Saved Explorers.

As late as 1924 Captain Bernier sailed in the steamship Franklin to the Arctic to claim for Canada the islands fringing the North American continent. His most famous voyages, however, were in the steamship Arctic. With that vessel he rescued explorers and placed caches at outposts never touched before. Many of those caches later saved lives. To his crews the caches came to be known as "Bernier's life-saving stations."



CAPT. JOSEPH E. BERNIER.

On many occasions Captain Bernier came close to disaster. One of his most narrow escapes was in Winter Harbor, Melville Island, where his vessel was nearly crushed by ice. On that island he and his crew placed a cross on a hill overlooking the harbor for the benefit of future navigators. The labor took many days, as the base for the cross was made of rocks carried from the lowland.

Not all of his expeditions were successful. A number of times he was turned back. In 1916 he sailed from Quebec to aid Professor Donald B. MacMillan. He was gone a year, during which time no word was heard of him. During his absence his wife died. He returned to find that while he had been beset by ice, Captain Bob aBrtlett had saved MacMillan and his crew. In 1918, during the World War, the explorer's vessel, the Percesion, sunk while on its way to Liverpool. The captain and crew were saved. Ltaer in the same year he saled into the Arctice to establish caches for Amundsen.

During the sixty years that Captain Bernier was at sea he is believed to have charted more than 500,000 square miles of land. He lectured extensively in an effort to make the Arctic region known to Canadians. In 1924 his vessel was among the first to use short-wave radio and as early as 1910 he expresesd his belief in a motor-driven tractor for Arctic land travel.

For four years the explorer was Governor of the Quebec prison, but he gave up the position to return to the sea. He had also been dock-master at Levis, where he resided for many years. He married twice. Both of his wives are dead, as is his only son.

DR. C. C. CRAFT DEAD; WAS AIDE OF PEARY

Went North With Explorer on Final Expedition That Attained the Pole.

ASHEVILLE, N. C., May 26.—Dr. Clarence Christian Craft, scientist and explorer, who accompanied Peary on his final expedition on which Peary attained the North Pole, died near here yesterday after suffering a stroke of paralysis. His age was 55. Funeral services were held this afternoon at Swansea, S.C.

Dr. Craft entered the South Carolina Military Academy and later received a medical degree at George Washington University. Meanwhile he had been in geodetic surveys for the government. In 1908 he joined Peary's expedition. Subsequently he participated in scientific work aboard the yacht Carnegie, serving as ship surgeon and magnetic observer from 1909 to 1911.

Polar Bears in Newfoundland.

ST. JOHN'S Nfld., March 25 (Canadian Press).—Two polar bears were sighted over the week-end at Twilingate, Nfld., far south of their usual Arctic haunts. A rifle shot brought down one bear, but its companion escaped.

The phenomenon of long-distance speaking in the Arctic was reported many years ago by explorers Vilhjalmur Stefansson declaring that at temperatures of 80 degrees below zero conversations were heard and understood at a distance of five or six miles and the the bark of a dog could be heard 15 miles away.

CAPTAIN MELVILLE, A BYRD AIDE, DIES

Cited for Safely Returning the Expedition as Master of the City of New York.

PHILADELPHIA, March 1 (AP).—Captain Frederick C. Melville, commander of Rear Admiral Richard E. Byrd's base ship Samson on the 1928 Antarctic expedition, died suddenly today on the freighter Angeles, headed for Delaware Breakwater. He was born in Lynn, Mass., fifty years ago.

Captain Melville was second mate on the Angeles, inbound from South America. He had finished his watch at midnight, and collapsed and died a short time later in the chartroom.

Captain Melville was master of the bark City of New York during the Byrd Antarctic expedition of five years ago. His safe navigation of the ship through the hazardous, ice-ridden Ross Sea to pick up the expedition at the end of its stay, and to return with it to civilization, won for him the Congressional Medal.

Captain Melville began his career as a seaman at the age of 13. His love for the sea was stimulated by an uncle, Herman Melville, author of "Moby Dick." Starting his career as an apprentice, the younger Melville worked his way up to able seaman, third mate, second mate, first mate and skipper, serving on both sail and steam-driven vessels.

His travels took him to the North and South Atlantic, the Pacific, the Mediterranean, the Indian Ocean and the China Sea, as well as to the frozen wastes of the Antarctic. Before he was 20, he had circled the globe three times.

During his long life before the mast, Captain Melville never saw a burial at sea. He was never shipwrecked. For this he was "very happy and thankful." He did, however, believe in some of the superstitions of the sea, and shared the belief that to kill an albatross is an ill omen

Captain Frederick C. Melville

BARON DE GERLACHE, EXPLORER, DIES, 69

Led Expeditions to Arctic and Antarctic—Head of Belgian Marine Bureau.

BRUSSELS, Dec. 4 (AP).—Baron de Gomery de Gerlache, Arctic and Antarctic explorer and holder of the Chicago and other Geographical Society medals, died here today at the age of 69.

Baron de Gerlache was director-general of the Belgian Marine Administration and president of the National Geographical Committee.

The promoter and leader of the first modern Antarctic scientific expedition, he also was the first to spend a Winter in the Antarctic pack ice.

He was the discoverer of Gerlache's Strait in Northern Graham Land during an expedition which started in 1897. He went to the Greenland Sea in 1905 and to the Kara Sea in 1907, and took an expedition into the Greenland and Barens Seas in 1909. His last three expeditions were with the Duc d'Orleans on the ship Belgica.

He was also leader of a scientific expedition to the Persian Gulf in 1901. Many writings on his explorations were published by him.

15 Sealing Ships Freed From Pack Ice in Arctic

OSLO, Norway, April 14.—Fifteen sealing ships, frozen fast in the pack ice for nearly three weeks, were extricated today, saving 160 hunters from a slow death by starvation or drowning.

Telegraphic advices said the hardy band was now en route home from the area near Jan Mayen Island, east of Greenland. Plans for a rescue expedition were canceled.

TRACTORS IN POLAR WORK

Gas Engines With Byrd Expedition Efficient

TRACTORS have done yeoman service with the Byrd Expedition in Antarctic Little America, where the weather sometimes runs as low as 70 degrees below zero. According to Lieut. Commander George O. Noville, fuel engineer and executive officer of the expedition, his own and other tractor crews have done hundreds of miles over the most treacherous terrain imaginable, and so far with success.

Getting the machines started in such cold would seem the greatest difficulty of all, but as a matter of fact it has given little if any trouble, it is said. The problem, previously studied by Lieut. Commander Noville, with the assistance of Tide Water Oil engineers, has now become a routine performance.

A few hours before a tractor is required the two gas tanks are filled to capacity, 170 gallons. The oil tank and crankcase are filled with fifteen gallons of lubricating oil. A heating torch is then applied under the crankcase. When the driver is ready to leave he extinguishes the torch, pulls off the tarpaulin covering the hood, presses the starter button and the engine gets off with a purr.

Then comes the job of steering the machine across the frozen wastes. Terrific wind has sometimes turned the tractors over; they have tumbled into crevasses and been completely snowed under. One of the tractors had to be abandoned under the ice sixty-seven miles out last May, but when the weather improves a party will set out to rescue it and put it to work again.

"Perhaps the greatest strain is that of pounding for hours over the flint like ice-covered sastrugi, or air bubbles, towing and carrying loads of four tons or more," Lieut. Commander Noville reported. "This is grueling punishment for men and machines. It might be compared to driving over a field strewn with huge broken boulders or traveling down a steep staircase."

But, after hours of grinding and bumping, the tractor comes upon a veritable boulevard, so smooth is the surface. This goes on for several miles of easy sailing, until, without warning road sign, soft snow is encountered and the engine labors and groans again.

Last October Harold I. June, chief aviator, piloted a tractor more than 200 miles under conditions described as particularly terrible. The load of 7,600 pounds made it necessary to travel practically the entire way in second speed. The route led over unexplored country and the temperature hovered around 40 below. The tractor carried an auxiliary oil tank under the hood, directly over the engine. The heat from the motor kept the oil warm and fluid, and from this tank the crankcase was replenished at regular intervals.

World's Ice Box Registers 103 Below

LENINGRAD, April 17 (AP).—The coldest place in the world, according to new Russian Arctic maps issued today, is Oimekon, in the Soviet Republic of Yakut, Siberia, 300 miles north of Okhotsk. The temperature there is reported to fall as low as 75 degrees below zero centigrade (103 degrees below zero F.) Formerly Verkhoyansk and Yakutsk were considered the world's ice-boxes.

PROF. BURTON DIES

GLOUCESTER, Mass., May 11.—Dr. Alfred E. Burton of Cambridge, first dean of Massachusetts Institute of Technology and roommate as a student at Bowdoin College and lifelong friend of the late Admiral Robert E. Peary, died here today at the home of a daughter, Mrs. George Demetrios, whom he was visiting. He was 78.

Born in Portland, Me., on March 24, 1857, Professor Burton was graduated in 1878 from Bowdoin. Early in his career he assisted Peary in organizing his expeditions, on one of which he accompanied the explorer to Greenland as head of a scientific party. On that occasion Peary removed the great Cape York meteorite to New York, where it was presented to the American Museum of Natural History.

Polar Bear Is Revealed As Perfect Camera Star

By The Associated Press.

ROCHESTER, N. Y., June 23.—Officials of the Eastman Kodak Company admitted today that Rochester's most widely known camera subject is Oscar, the polar bear in the Seneca Park zoo here. It was not until today that the secret came out—Oscar is the most widely photographed animal in the world.

Officials of the camera plant disclosed that Oscar was the perfect camera subject for testing new films developed by the company in its plant here. He has rhythm and he has color. He ambles across his cage, a perfect symphony of grace and motion. And his thick, creamy-colored coat provides just the right color to test the new fast films in all sorts of light and climatic conditions.

Russians Will Try to Find Mysterious Gillis Land

By The Associated Press.

MOSCOW, April 1.—A Soviet polar expedition aboard the ice-breaker Sidoff will set out next Summer in a new search for the mysterious Gillis Land, it was announced today. Gillis Land is reported to have been seen only twice since its discovery more than 300 years ago.

An English captain named Gillis, sailing northeast from Spitzbergen into the Arctic Ocean, marked it on a map and named it after himself in the year 1607, but left no further records of it.

In 1899 a Russian admiral named Makharoff, navigating aboard an ice-breaker, reported seeing it, but could not approach because the ice was too thick. Captain Warmsley, an Englishman, again reported seeing it in 1925. Three years later, however, the ice-breaker Krassin looked in vain for Gillis Land.

H. G. PONTING DEAD; FILMED SCOTT TRIP

English Explorer Was Officer on Antarctic Expedition of Two Decades Ago.

LONDON, Feb. 7. — Herbert George Ponting, noted explorer who was photographic officer on Scott's last Antarctic expedition in 1910-13, died today at the age of 64.

Herbert G. Ponting had lectured on the Scott Expedition more than 1,000 times at the Philharmonic Hall in London and before the King and royal family in Buckingham Palace. His film of the great exploit, "At the South Pole," was presented in New York at the Lyric Theatre in February, 1929, before a distinguished audience that included several famous explorers.

Mr. Ponting's life was filled with travel and adventure. A son of the late F. W. Ponting of Hesketh Park, Southport, England, he went to California in 1900, and the next year represented Leslie's Weekly with the American Army in the Philippines. He spent three years in Japan and was a correspondent for Harper's Weekly with the First Japanese Army in Manchuria in the Russian war. His travels carried him around the world three times.

In 1909 Mr. Ponting received the highest award for travel photography at the Dresden International Photographic Exhibition. He was a member of the Spitzbergen Expedition of 1918. In 1926 he was elected an honorary life member of the American National Geographic Society. He received the King George V Polar Medal and the Royal Geographical Medal for Antarctic exploration. His writings, in addition to many contributions to American and British periodicals, included "Fujisan," "In Lotus-Land" and "The Great White South."

In 1926 Mr. Ponting sold his Scott expedition film to British interests for considerably less than $250,000, the sum said to have been offered by an American museum.

NORWEGIANS DISCOVER NEW ANTARCTIC LAND

Captain of Oil Tanker Hoists Oslo's Flag on Bare Territory in Enderby Quadrant.

OSLO, Norway, March 12.—New territory, which has been named Ingrid Christensen's Land, has been discovered in the Antarctic by the Norwegian oil tanker Thorshavn and taken possession of in the name of Norway.

Partly covered by ice and partly bare and without any vegetation, the newly discovered land lies between Long. 73 and 80.45 degrees E. and Lat. 67.50 and 69.10 degrees S. in the Enderby Quadrant.

The captain of the Thorshavn, which is owned by the Lars Christensen Whaling Company, went ashore and hoisted the Norwegian flag, naming the territory after Christensen's wife. He also took photographs and left a depot of stores.

The discovery not only is important in the mapping of the Antarctic regions, but it also may impel Norway to annex more territory in the frozen south. Some explorers hold that the Antarctic contains considerable possibilities of exploitation. Several years ago Norway carried on a controversy with Great Britain over the ownership of Bouvet Island, which is valuable to Norwegian whalers operating in the Antarctic.

The latest discovery means that Norwegians have finally found the missing link between King Leopold's Land and Queen Astrid Land and Lars Christensen's Land.

WON'T TAKE POLAR LAND.

Norway Does Not Plan to Annex Wide Antarctic Area.

OSLO, March 13.—The Norwegian Government does not plan to annex all the lands between the eastern limit of Queen Maud's Land and the western limit of Crown Princess Martha's Land in the Antarctic, according to a statement made by Premier Johann Ludwig Mowinckel today.

The Antarctic expert Aagaard suggested that annexation was contemplated following his announcement yesterday that the Norwegian vessel Thorshavn had discovered new land in the Antarctic, taken possession of it for Norway and named it Ingrid Christensen's Land.

CAPE TOWN, March 13.—The Norwegian ship Thorshavn arrived here today with the British research ship Discovery II. A chance opening in the pack ice enabled the Thorshavn to approach the new land, the captain explained.

He described the new land as having a rocky coastline and usually icebound. Immense flocks of penguins were the only living creatures on it, he said.

SURVEYING THE ANTARCTIC

By J. M. Wordie
in "The London Times"
June 4

The Royal Research Ship Discovery II. reaches St. Katharine Dock to-day. She thus completes her third commission, which, like the others, has been of 20 months' duration so as to cover two Antarctic summer seasons. The scientific work has this time been in the charge of Dr. N. A. Mackintosh, with Mr. H. F. P. Herdman as chief hydrologist, and Lieutenant A. L. Nelson, R.N.R., in executive command.

She left the Thames on October 21, 1933, and five weeks later was on the whaling grounds at South Georgia, having made a slight détour to the east in order to call at Tristan da Cunha. Two days were spent at the island; stores and mails were landed, and particular importance attaches to the careful medical examination which was made during this period by the ship's surgeon, Dr. Purser, who found the physical standard to be satisfactory. The captain was impressed by the natural politeness of the islanders, the doctor by their cleanliness both in person and in clothing, despite the absence of soap.

A few days only were spent at South Georgia, which was reached on November 28. A line of stations was then made across the Scotia Sea to the South Shetlands, and from there due north in 78deg. W. longitude to the western opening of the Straits of Magellan. This was part of a considered programme begun on a previous commission in order to make repeated studies in full of the nature of the sea water and of its plant and animal life across the western end of Drake Passage, a sector of the Antarctic where the conditions are not complicated by the presence of submarine banks and island groups. The primary object of the observations is to follow the great seasonal changes in the water movements and so trace the circulation of the marine animals and plants on which the whales and all other Antarctic life are ultimately dependent.

A return was then made to Port Stanley in the Falklands, and stores and fuel were taken on board for crossing the Pacific.

Stanley was left on December 27, 1933, and the passage across to Auckland took five weeks. It was carried out in the following way: the ship would first run down diagonally to the ice edge, make observations, and then steam north-west for a day and a half, turn sharp left, and so back to the ice edge. It was so arranged that two stations were always made at the edge, one in the late evening on arrival and one on the morning following; should the ice pack be unexpectedly far north the ship would skirt westwards along it till the normal observation time. By this method the stations were properly spaced and also a fragmentary but sufficient knowledge was obtained of the general run of the ice edge.

OCEAN "PASTURES"

Thirty full stations were made during the cruise, and in addition there were 19 subsidiary "towing" stations. This was a remarkable achievement only made possible by the mutual understanding and efficiency of both scientists and crew. A full station takes from three to four hours; it includes a sounding and the noting of meteorological data; of chief importance are the observations of sea temperature taken at at least 20 points between the surface and the bottom—here from two and a half to three miles deep—and the collection of water samples for chemical analysis from these same points. Concurrently a series of hauls are made, both vertically and horizontally, with nets of varying mesh; those of finest mesh (200 meshes to the linear inch) are designed to collect the microscopic vegetation which constitutes the "pastures" of the ocean, and is as important at sea as on land; those of medium mesh are for the smaller forms of animal life, including young stages of whale food; and the largest for the adult whale food, a prawn some 2½in. in length—the so-called "krill," which forms the only food of the large rorquals. A towing station is confined to using certain of the nets to keep a check on the intervals between stations, as the distribution of the animal and plant life is sometimes patchy.

The return voyage from New Zealand was begun somewhat earlier than had been planned as it was urgently necessary to go down to the Ross Sea to help Rear-Admiral Byrd. It may be recalled that Byrd's appeal was taken up by Discovery II. at Auckland on February 9; she left on February 11; on February 14 she was at Dunedin, and making all speed left next day at noon for the South. It was a race against the winter freeze-up in the Ross Sea. Byrd's ship, the Bear of Oakland, was steaming north to meet her, and on February 22 they met, and made the transfer of personnel and stores of which Byrd was so much in need. The speed and energy shown by the captain on this occasion deserve the highest praise. The two ships were about 12 hours in company; less than an hour after they parted Discovery II.'s staff were at work on their first station.

The season was now late, and a passage in these high southern latitudes was not without risk. At times the ship ran into newly forming ice in the different stages of its growth from a scum like soapsuds or smallish disks to the larger "pancake" several feet in diameter. Peter 1st Island was passed on March 8; and finally the south to north series of stations in about the meridian of 80deg. W. was repeated, and passing through Magellan Straits Discovery II. finally reached Port Stanley on March 22, 1934.

IN THE ANTARCTIC
Discovery II., the British research ship, photographed surrounded by fight pack ice.

By completing the return route of the Pacific cruise she rounded off the second stage of a long-range programme. A close examination of ice edge conditions in the Pacific was to be the central feature of the third commission. What was now being studied was the region in the Pacific between the Antarctic convergence and the ice edge. A particular reason attaches to this work being done. The Pacific has not so far been the scene of any pelagic whaling, and this sector of the Antarctic has accordingly at times been suggested as a possible sanctuary. This, however, raises two problems: whether there is any concentration of whales in the Pacific comparable with that found in the Atlantic, and if this is the case whether the whales there are of interchangeable stock with the Atlantic whales. Answers, it is hoped, will now be given to both these questions.

A few days only were spent at Stanley. The Falklands were left on March 27, and on March 30 the ship passed east of Clarence Island and Elephant Island, where Shackleton's men had wintered in 1916. Thence she made the South Orkneys, and from there took a line of observations northwards along the 44th meridian, reaching South Georgia on April 10.

MEETING WITH RYMILL

The second season began almost as much under winter conditions as the first in its turn had ended. Such was necessary in both cases, as the programme had been laid down that a comparison was required of summer and winter conditions in the Falklands sector. Discovery II. sailed from Capetown, therefore, on August 1, 1934, and arrived at Magellanes in the middle of October; a notable discovery had been the fixing of the positions of greatest concentration of the plankton at different seasons, which goes far to settle an important problem which had not hitherto been solved.

The previous season's work may have appeared both full and varied. The second was equally so. Zigzags were run westwards between 70deg. W. and 110deg. W., and a return then made between these same limits of longitude, but at more northern latitudes. The result of this manoeuvre has been to provide the East Pacific sector with a network of traverses made in four separate months, and these show the differences in animal and plant concentration and temperature variations with respect not only to latitude, but also to the time of year.

The Discovery II. was back at Port Stanley on November 24. She was now under orders to assist the British Graham Land Expedition whenever possible, consistent with her own scheme of work in the Falkland Islands Dependencies. Mr. Rymill's ship the Penola arrived at Stanley on November 28. On the Discovery II many, both officers and crew, had had as many as eight years' experience of the South Shetlands and Graham Land; Rymill's party were new to the work, but given time they will carry their explorations into regions far beyond those which are accessible to the research ship.

THE FALKLANDS

A feature of the Discovery Committee's endeavours has been the mapping of the various dependencies of the Falkland Islands. In addition, running surveys have been made of the South Sandwich group on the first commission, and of the South Orkneys during the second. The resulting charts are all the work of Lieutenant Nelson, who continues to be surveyor as well as captain of the ship. Similar mapping in the South Shetlands has been much more difficult, but it can at last be said that the South Shetland running survey is now practically complete.

The Discovery II. was back at South Georgia on January 27. She was now homeward bound, but only after a further run towards Enderby and thence to Capetown. This work was very much the same as that done previously, but carried out earlier in the season. Many ships were about, large factory ships and the smaller catchers. Of most interest, however, was the near presence of the whale marker, William Scoresby. The ships never met, but there was frequent talk by wireless. They are working towards the same objective, though by different methods. Discovery II. has now almost completed exploring the whale's habitat and the life history of its food supply; the William Scoresby has only just begun marking the whales in order to know whence and where they travel, at what speed, and in what numbers. Discovery II. was first to leave the South, but the Scoresby has reached London before her, for from Capetown the bigger ship's route took her south-east to Marion Island, and from there northwards through the Indian Ocean and home *via* the Suez Canal. She will be in London for a few months only, as she is already under orders to leave again in the autumn on her fourth and probably final commission.

Royal Research Ship Discovery II. Admiralty Bay, King George Island, in the South Shetlands, with newly-formed ice